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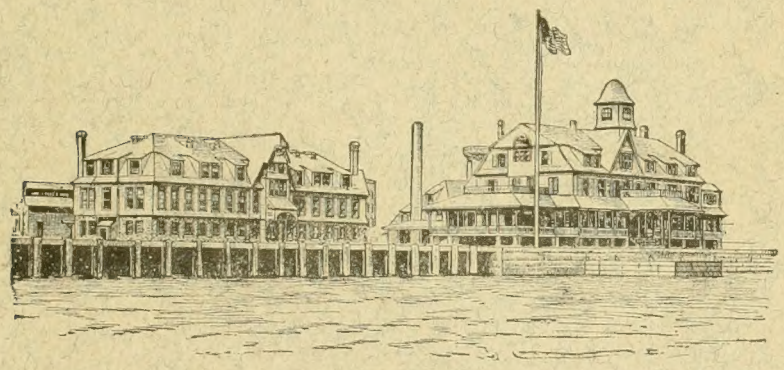
CONTRIBUTIONS FROM THE BIOLOGICAL LABORATORY OF THE U. S. FISH COMMISSION, WOODS HOLE, MASSACHUSETTS.

PARASITES OF FISHES OF THE WOODS HOLE REGION.

BY

EDWIN LINTON, Ph. D.,
Professor of Biology in Washington and Jefferson College.



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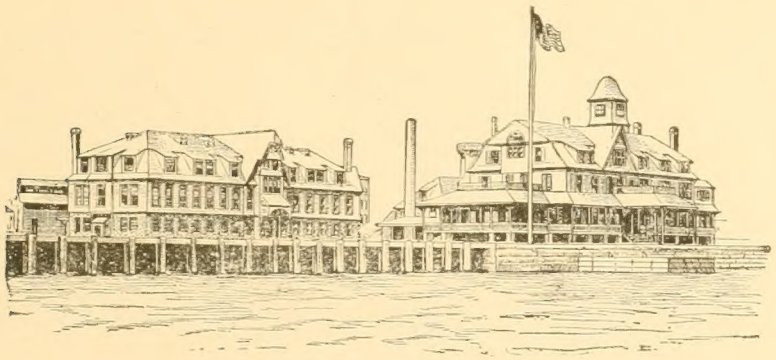

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CONTENTS.

PARASITES OF FISHES OF THE WOODS HOLE REGION.

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INTRODUCTION.

It is a matter of much importance that our knowledge of parasites which infest fishes be greatly extended, and it is of almost equal importance that the parasites of invertebrates be studied, since many, if not most, of the parasites of fishes pass a portion of their lives in invertebrate hosts which serve as food for fishes. It is thus evident that the parasites of invertebrates, the food of fishes, and the parasites of fishes are quite closely interrelated subjects.

The more our knowledge of the life-histories of fish parasites is increased the speedier will be the diagnoses and the more effective will be the remedies which may be made and applied in all cases of epidemic diseases among fishes which are due to parasites. Naturally such cases can be handled best in ponds and lakes and the smaller streams. But with a thorough knowledge of the interrelations of marine life, it is not unreasonable to think that even in the sea something may be done to turn the scale in favor of those fishes which are useful as food.

Certain economical questions relating to parasitism have been discussed by the author in an article in the Fish Commission Bulletin for 1893 entitled "Some observations concerning fish parasites," and in the Fish Commission Bulletin for 1897 in an article entitled "An economical consideration of fish parasites."

This paper contains: (1) An annotated list of the parasites of Woods Hole fishes which have been described by the author in various papers published in the Reports and Bulletins of the United States Fish Commission and the Proceedings of the United States National Museum.

(2) A preliminary notice of collections made in the summers of 1899 and 1900 at Woods Hole, Massachusetts.

(3) Notes on Nematodes which have been collected in successive years, for the most part in the waters of southern New England.

(4) Notes on the food of the fishes which were examined for entozoa.

The authority for the names of fishes is Jordan & Evermann's Fishes of North and Middle America (Bulletin 47, U. S. National Museum).

The author's papers are referred to by number. See page 424 for the list and numbers.

Notes on the food of the fishes which have been examined have been introduced with greater fullness than has been done in previous papers. The arrangement of

the subject-matter under the several hosts has greatly facilitated this plan. In all cases, where not explicitly stated to be otherwise, the food notes state the food as it was actually found in the Woods Hole fishes.

Analytical keys for the determination of genera of cestodes and species of distomes mentioned in this paper have been introduced. For the determination of monogenetic trematodes recourse may be had to Pratt's Synopsis of the Heterocotylea (American Naturalist, vol. XXXIV, pp. 645–662).

But few changes have been made in the nomenclature adopted in former papers, although this is not because the author is entirely satisfied with the old. The cestode originally called *Oxygnatobothrium angustum* has been referred in this paper to the genus *Crossobothrium*. Following the nomenclature of Pratt's excellent synopsis, *Octobothrium denticulatum* becomes *Dactylocotyle denticulatum*, *Octoplectanum affine* becomes *Didiclophora affinis*, *Nitzschia elegans* becomes *N. elongata*, and *Tristomum rudolphianum* becomes *T. molæ*.

The generic name *Distomum* is retained, as it is sufficiently definite for the purposes of this paper. During the past summer the author has been much impressed by the variety of shapes which the same species of distome may assume, even when it is under the same conditions. When variations in conditions are made, as, for example, when some are placed in fresh water, others in sea water, others in normal salt solution, or when they are killed under pressure with application of heat, or when different killing fluids are used; further, when differences in age of specimens are considered, as affecting the occurrence of spines on the body or around the mouth, or the relative proportions and even disposition of the reproductive organs, the variety of forms to be found in the same species is very great. The variation in proportions of the muscular suckers, even, is often considerable among the individuals of the same species, and the ova, while furnishing a valuable criterion of species, frequently vary in the same species and even in the same individual.

The explanation of the wide distribution of such a form as the species identified as *Distomum appendiculatum* is doubtless to be found in the nature of the intermediate host or hosts. Pratt[1] describes an immature appendiculate distome which he finds in copepods, which, without much doubt, is the young of this species. Since copepods furnish the principal food of the majority of the young of the food-fishes, it is easy to understand how the latter became infected. It is to be noted further that most of the fish in which this distome was found were young.

While this report concerns itself principally with helminth entozoa, a few ectoparasites, both helminths and copepods, and a few sporozoa are noted. Some deep-water fishes are included which do not belong to the Woods Hole fauna.

Notes on the nematodes, which have been collected by or for the author at Woods Hole, are given, together with notes on nematodes which were found in a collection of entozoa belonging to the United States National Museum, the cestodes and trematodes of which were reported on in vols. XIX and XX of the Proceedings of the National Museum (Nos. **4**, **5**, and **6**, p. 424). The great majority of these nematodes are immature and no attempt has been made to give them specific names. A few adult forms, with sufficiently conspicuous characteristics, have been described as new species. These will be found in the alphabetic list of nematodes (p. 410–411).

[1] A Contribution to the Life-history and Anatomy of the Appendiculate Distomes, Zoolog. Jahrb. XI, 1898.

Alphabetical lists have been prepared, both of the parasites which have been found and the fishes which have been examined; in the former the name of the host is also given. By means of these lists and the numerous cross references, which will be found in the text, the arrangement of the material under the hosts should not be inconvenient to the zoologist; while the collection of the several species which have been found under each host, together with such food notes as have been made, will be a beginning of the practical economic study of parasitism in the food-fishes. It is very desirable that a summary of the invertebrate intermediate hosts of fish parasites be made, but thus far very little work has been done on the parasites of invertebrates.

Efficient assistance in the collection of material was rendered in the summer of 1899 by Messrs. J. A. Stewartson and W. W. Francis, and in 1900 by Mr. C. W. Stone. Grateful mention is also made of Mr. Vinal N. Edwards, whose amazing energy, vast knowledge of local conditions, and unfailing accuracy have been of invaluable service.

List of parasites of Woods Hole fishes.

ACANTHOCEPHALA.

List of parasites of Woods Hole fishes—Continued.

NEMATODA.

Parasite.	Host.	Page.
Acanthocheilus nidifex Linton	Galeocerdo tigrinus	426
Acanthocheilus sp	Carcharias littoralis	428
Agamonema capsularia Diesing, referred to under.	Anguilla chrysypa	435
	Clupea harengus	437
	Scomber scombrus	444
Agamonema papilligerus	See under Scomber scombrus	444
Ascaris acanthocaudata Cobbold	See under Melanogrammus æglefinus	476
Ascaris capsularia Rudolphi. See under.	Gadus callarias	476
	Scomber scombrus	444
Ascaris brevicapitata sp. nov	Galeocerdo tigrinus	425
	Gadus callarias	475
	Pollachius virens	474
Ascaris clavata Rudolphi	Scomberomorus maculatus	446
	See also under Pomolobus mediocris and Scomber scombrus	438
		444
Ascaris labena Linton	Opsanus tau	468
Ascaris inerescens Molin	Coryphæna hippurus	452
	Lophius piscatorius	487
	Hippoglossus platessoides	481
	Seriola zonata	448
Ascaris incurva Rudolphi	Scomberomorus maculatus	446
	Tetrapterus imperator	447
	Xiphias gladius	448
Ascaris inquies sp. nov	Rachycentron canadum	452
Ascaris linstowi sp. nov	Nematonurus goodei	479
Ascaris maeruri Linstow and Ascaris macruroidei Linstow.	See under Nematonurus goodei	479
Ascaris neglecta Leidy	Chilomycterus schœpfi	[illegible]
Ascaris rigida Rudolphi	See under Lophius piscatorius	488
	Chimæra affinis	[illegible]
Ascaris rotundata Rudolphi	Raja eglanteria	[illegible]
	Raja erinacea	[illegible]
	Raja ocellata	[illegible]
	Cottunculus thomsonii	[illegible]
	Hemitripterus americanus	[illegible]
	Mustelus canis	[illegible]
	Myxocephalus æneus	[illegible]
	Paralichthys dentatus	[illegible]
Ascaris sp.	Phycis tenuis	[illegible]
	Pomolobus mediocris	[illegible]
	Pseudopleuronectes americanus	[illegible]
	Sarda sarda	[illegible]
	Sciænops ocellatus	[illegible]
	Stenotomus chrysops	[illegible]
Ascaris sp., immature; see also Nematodes, immature.	Alosa sapidissima	[illegible]
	Brosmius brosme	[illegible]
	Carcharias littoralis	[illegible]
	Clupea harengus	[illegible]
	Dasyatis centrura	[illegible]
	Glyptocephalus cynoglossus	[illegible]
	Lagocephalus lævigatus	[illegible]
	Macrourus bairdii	[illegible]
	Menticirrus saxatilis	[illegible]
	Microgadus tomcod	[illegible]
	Osmerus mordax	[illegible]
	Roccus lineatus	[illegible]
	Sciænops ocellatus	[illegible]
	Scomber scombrus	[illegible]
	Tylosurus acus	[illegible]
Cucullanus elegans Zeder	Salvelinus fontinalis	[illegible]
Cucullanus globosus Zeder	Gadus callarias	[illegible]
	Lophius piscatorius	[illegible]
Cucullanus sp	Fundulus heteroclitus	[illegible]
Cucullanus sp.	Rhombus triacanthus	[illegible]
Daenitis hians Dujardin	Leptocephalus conger	[illegible]
Daenitis sphærocephala Dujardin	Acipenser sturio	[illegible]
Filaria rubra Leidy	Centropristes striatus	[illegible]
	Roccus lineatus	[illegible]
Filaria serrata sp. nov	Phycis tenuis	[illegible]
	Lobotes surinamensis	[illegible]
Ichthyonema globiceps Rudolphi	Pomatomus saltatrix	[illegible]
	Scomberomorus maculatus	[illegible]
	Tarpon atlanticus	[illegible]
Ichthyonema sanguineum Rudolphi	Paralichthys dentatus	[illegible]
Ichthyonema sp.	Chætodipterus faber	[illegible]
Ichthyonema sp.	Hippoglossus platessoides	[illegible]
Ichthyonema sp.	Sarda sarda	[illegible]
Ichthyonema sp.	Sphyrna zygæna	[illegible]
Lecanocephalus annulatus Molin	Roccus lineatus	[illegible]
Nematodes, immature, many evidently belonging to the genus Ascaris; usually encapsuled on the viscera.	Anguilla chrysypa	[illegible]
	Antimora viola	[illegible]
	Bothus maculatus	[illegible]
	Carcharinus milberti	[illegible]

List of parasites of Woods Hole fishes—Continued.

NEMATODA—Continued.

Parasite.	Host.	Page.
Nematodes, immature, many of them evidently belonging to the genus Ascaris; usually encapsuled on the viscera.	Centropristes striatus	456
	Cynoscion regalis	459
	Enchelyopus cimbrius	479
	Fundulus heteroclitus	441
	Gadus callarias	476
	Isurus dekayi	429
	Leptocephalus conger	436
	Limanda ferruginea	484
	Lobotes surinamensis	457
	Lophius piscatorius	488
	Lopholatilus chamæleonticeps	472
	Melanogrammus æglefinus	476
	Menidia notata	443
	Merluccius bilinearis	473
	Mola mola	465
	Myxocephalus æneus	467
	Paralichthys dentatus	481
	Paralichthys oblongus	484
	Phycis tenuis	477
	Pollachius virens	474
	Pomatomus saltatrix	450
	Pomolobus pseudoharengus	438
	Prionotus carolinus	470
	Pseudopleuronectes americanus	485
	Raja erinacea	431
	Raja ocellata	431
	Rhombus triacanthus	483
	Salmo salar	441
	Sarda sarda	446
	Scomberomorus maculatus	446
	Sphyrna zygæna	428
	Stenotomus chrysops	458
	Stolephorus brownii	440
	Tautogolabrus adspersus	462
	Trachurops crumenophthalmus	449
	Urophycis chuss	478
Nematode, undetermined	Macrourus bairdii	480
Spiroptera pectinifer sp. nov	Sphyrna zygæna	427

CESTODA.

Acanthobothrium coronatum Rudolphi	Raja lævis	431
Acanthobothrium paulum Linton	Dasyatis centrura	433
	Myliobatis freminvillei	434
Anthobothrium laciniatum Linton	Carcharinus milberti	426
	Carcharinus obscurus	427
	Isurus dekayi	429
	Sphyrna zygæna	428
Anthobothrium pulvinatum Linton	Dasyatis centrura	432
Anthocephalum gracile Linton	Dasyatis centrura	433
Calliobothrium eschrichtii Beneden	Mustelus canis	425
Calliobothrium verticillatum Rudolphi	Mustelus canis	425
Calyptrobothrium occidentale Linton	Tetronarce occidentalis	432
Cestode larva	Decapterus macarellus	449
Cestode larva from squid	See under Cynoscion regalis	460
Cestode larva	Sarda sarda	446
Cestode, genus inquirenda	Lopholatilus chamæleonticeps	472
Crossobothrium angustum Linton	Carcharinus milberti	426
	Carcharinus obscurus	427
Crossobothrium laciniatum Linton	Carcharias littoralis	429
Cysts, degenerate	Carcharinus obscurus	427
Cysts	Raja ocellata	431
Cysts in liver	Roccus lineatus	466
Cysts in kidney	Stenotomus chrysops	459
Dibothrium aluteræ Linton	Alutera schœpfii	464
Dibothrium angustatum Rudolphi	Merluccius bilinearis	474
	Rhombus triacanthus	454
Dibothrium crassiceps Rudolphi	Merluccius bilinearis	473
	Pomatomus saltatrix	451
Dibothrium laciniatum Linton	Tarpon atlanticus	467
Dibothrium ligula Donnadieu	Osmerus mordax	441
Dibothrium manubriforme Linton	Istiophorus nigricans	448
	Tetrapterus imperator	447
Dibothrium microcephalum Rudolphi	Mola mola	465
Dibothrium punctatum Rudolphi	Bothus maculatus	484
	Limanda ferruginea	487
	Paralichthys oblongus	484
	Scomber scombrus	446
Dibothrium restiforme Linton	Tylosurus acus	444

List of parasites of Woods Hole fishes—Continued.

CESTODA—Continued.

Parasite.	Host.	Page.
Dibothrium rugosum Rudolphi	Gadus callarias	175
Dibothrium plicatum Rudolphi	Xiphias gladius	148
Dibothrium sp.	Mustelus canis	130
Dibothrium sp., larva	Myxocephalus æneus	167
Dibothrium sp., young	Scomber scombrus	141
Discocephalum pileatum Linton	Carcharinus obscurus	127
Echeneibothrium affine Olsson	See under Rhinoptera bonasus.	144
Echeneibothrium larvæ. See Scolex polymorphus.		
Echeneibothrium variabile Beneden	Raja erinacea	137
Echeneibothrium sp.	Myliobatis freminvillei	141
	Rhinoptera bonasus	144
Lecanicephalum peltatum Linton	Dasyatis centrura	134
Ligula chilomyeteri	Chilomyeterus schœpfi	166
Monorygma chiamedoschachi Lönnberg	See under Isurus dekayi	130
Monorygma sp.	Carcharinus milberti	124
	Galeocerdo tigrinus	132
	Isurus dekayi	129
Onchobothrium uncinatum Diesing	Dasyatis centrura	134
Orygmatobothrium angustum Linton. See Crossobothrium angustum.		
Orygmatobothrium crenulatum Linton	Dasyatis centrura	134
Orygmatobothrium paulum Linton	Galeocerdo tigrinus	132
Otobothrium crenacolle Linton	Sphyrna zygæna	128
Otobothrium dipsacum Linton	Pomatomus saltatrix	143
Parataenia medusia Linton	Dasyatis centrura	134
Phoreiobothrium basium Linton	Carcharinus milberti	124
	Carcharinus obscurus	127
	Sphyrna zygæna	128
Phoreiobothrium trilocultatum sp. nov.	Carcharinus obscurus	127
Phyllobothrium foliatum Linton	Dasyatis centrura	134
Phyllobothrium thysanocephalum. See Thysanocephalum crispum.		
Phyllobothrium sp., immature	Merluccius bilinearis	141
Platybothrium cervinum Linton	Carcharinus obscurus	127
	Carcharinus milberti	124
Platybothrium parvum sp. nov	Isurus dekayi	130
	Sphyrna zygæna	128
	Dasyatis centrura	134
Rhinebothrium cancellatum Linton	Rhinoptera bonasus	144
Rhinebothrium flexile Linton	Dasyatis centrura	134
Rhinebothrium longicolle Linton	Myliobatis freminvillei	141
Rhinebothrium minimum Beneden	Raja lævis	141
Rhodobothrium pulvinatum. See Anthobothrium pulvinatum.		
Rhynchobothrium agile Linton	Myliobatis freminvillei	141
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Rhynchobothriumattenuatum Rudolphi	Xiphias gladius	148
Rhynchobothrium bisuleatum. See Tetrarhynchus bisulcatus.		
Rhynchobothrium brevispine Linton	Rhinoptera bonasus	144
Rhynchobothrium bulbifer Linton	Mustelus canis	130
	Alutera schœpfii	164
	Anguilla chrysypa	156
	Cynoscion regalis	160
Rhynchobothrium bulbifer, cysts	Paralichthys dentatus	182
	Pomatomus saltatrix	143
	Scomber scombrus	141
	Scomberomorus maculatus	147
Rhynchobothrium heterospine Linton	Mustelus canis	130
	Anguilla chrysypa	156
Rhynchobothrium heterospine, cysts	Paralichthys dentatus	182
	Siphostoma fuscum	162
Rhynchobothrium hispidum Linton	Dasyatis centrura	134
	Myliobatis freminvillei	141
	Raja erinacea	137
Rhynchobothrium imparispine Linton	Raja lævis	141
	Raja ocellata	141
	Tetronarce occidentalis	142
	Anguilla chrysypa	156
	Bothus maculatus	184
	Centropristes striatus	159
	Clupea harengus	137
	Gadus callarias	176
	Leptocephalus conger	155
Rhynchobothrium imparispine, cysts	Limanda ferruginea	180
	Lophius piscatorius	188
	Melanogrammus æglefinus	176
	Microgadus tomcod	179
	Paralichthys dentatus	182
	Scomber scombrus	140
	Stenotomus chrysops	168
Rhynchobothrium lomentaceum Diesing	Mustelus canis	130
Rhynchobothrium longicorne Linton	Carcharias littoralis	120

List of parasites of Woods Hole fishes—Continued.

CESTODA—Continued.

Parasite.	Host.	Page.
Rhynchobothrium longispine Linton	Dasyatis centrura	133
	Chætodipterus faber	166
	Cynoscion regalis	160
	Lophius piscatorius	188
	Paralichthys dentatus	180
	Pomatomus saltatrix	151
Rhynchobothrium speciosum Linton, cysts.	Remora remora	175
	Roccus lineatus	159
	Scomber scombrus	145
	Scomberomorus maculatus	147
	Stenotomus chrysops	158
	Tylosurus acus	143
Rhynchobothrium tenuispine Linton	Carcharinus milberti	120
	Dasyatis centrura	133
Rhynchobothrium tumidulum Linton	Mustelus canis	125
	Raja erinacea	131
Rhynchobothrium tumidulum, scolices	Opsanus tau	168
Rhynchobothrium wageneri Linton	Dasyatis centrura	133
	Alutera schœpfii	161
	Anguilla chrysypa	136
	Caranx chrysos	140
	Carcharias littoralis	120
	Centropristes striatus	146
	Clupea harengus	137
	Cynoscion regalis	160
	Decapterus macarellus	149
	Macrourus bairdii	180
	Merluccius bilinearis	174
	Menidia notata	143
	Microgadus tomcod	170
	Mola mola	166
Rhynchobothrium cysts—too immature for certain identification, or not yet identified.	Mustelus canis	125
	Myliobatis freminvillei	134
	Myxocephalus æneus	167
	Paralichthys dentatus	182
	Paralichthys oblongus	184
	Phycis tenuis	177
	Pollachius virens	174
	Prionotus carolinus	171
	Rhombus triacanthus	153
	Sarda sarda	149
	Scomberomorus regalis	147
	Stenotomus chrysops	158
	Stolephorus brownii	140
	Tautogolabrus adspersus	162
	Urophycis chuss	178
	Anguilla chrysypa	136
	Brevoortia tyrannus	140
	Centropristes striatus	146
	Clupea harengus	137
	Cynoscion regalis	159
	Decapterus macarellus	149
	Fundulus heteroclitus	142
	Lagocephalus lævigatus	164
	Leptocephalus conger	136
	Limanda ferruginea	156
	Lophius piscatorius	188
	Lopholatilus chamæleonticeps	172
	Menticirrus saxatilis	161
	Merluccius bilinearis	174
Scolex polymorphus Dujardin	Microgadus tomcod	170
	Palinurichthys perciformis	153
	Paralichthys dentatus	182
	Paralichthys oblongus	184
	Pomatomus saltatrix	151
	Pomolobus mediocris	138
	Pomolobus pseudoharengus	139
	Rhombus triacanthus	153
	Sarda sarda	149
	Scomber scombrus	144
	Spheroides maculatus	167
	Stenotomus chrysops	158
	Stolephorus brownii	140
	Tylosurus marinus	142
Spongiobothrium variabile Linton	Dasyatis centrura	133
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	Pomatomus saltatrix	151

List of parasites of Woods Hole fishes—Continued.

CESTODA—Continued.

Parasite.	Host.	Page.
Synbothrium filicolle, cysts	Scomberomorus maculatus	447
	Scomberomorus cavalla	447
	Scomberomorus regalis	447
Syndesmobothrium. See Synbothrium.		
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Tænia gibbosa Leidy	See under Sphyrna zygæna	428
Tænia sp.	Anguilla chrysypa	435
Tænia sp.	Sphyrna zygæna	428
Tænia?	Lopholatilus chamæleonticeps	472
Tetrabothrium barbatum Leidy	See under Carcharias littoralis	429
Tetrarhynchus bicolor Bartels, cysts and scolices.	Carcharinus obscurus	427
	Coryphæna hippurus	452
	Galeocerdo tigrinus	426
	Paralichthys dentatus	482
	Sarda sarda	446
	Xiphias gladius	448
Tetrarhynchus bisulcatus Linton	Carcharinus obscurus	427
Tetrarhynchus bisulcatus, cysts and scolices.	Cynoscion regalis	469
	Decapterus macarellus	440
	Lopholatilus chamæleonticeps	472
	Paralichthys dentatus	482
	Paralichthys oblongus	484
	Pomatomus saltatrix	441
	Prionotus carolinus	471
	Pseudopleuronectes americanus	486
	Seriola zonata	448
	Stenotomus chrysops	468
	Tetronarce occidentalis	452
Tetrarhynchus elongatus Wagener	Mola mola	466
Tetrarhynchus erinaceus Beneden, cysts	Cynoscion regalis	469
	Pomatomus saltatrix	441
	Rhombus triacanthus	484
	Dasyatis centrura	433
	Isurus dekayi	466
Tetrarhynchus robustus Linton	Myliobatis freminvillei	434
	Raja lævis	431
	Rhinoptera bonasus	434
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List of parasites of Woods Hole fishes—Continued.

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[1] Distomum auriculatum Wedl (?)	Acipenser rubicundus	135
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[1] Pratt proposes the name Bunodera lintoni for this species.
[2] The name Hemiurus lintoni is proposed for this species by Pratt.

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TREMATODA, ENDOPARASITIC—Continued.

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	Decapterus macarellus	449
	Leptocephalus conger	436
	Limanda ferruginea	485
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	Paralichthys dentatus	482
	Pomatomus saltatrix	451
	Pomolobus pseudoharengus	439
	Pseudopleuronectes americanus	486
	Sarda sarda	446
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Distomum sp	Lagocephalus lævigatus	464
Distomum sp	Limanda ferruginea	485
Distomum sp	Menidia notata	444
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Distomes	Opsanus tau	469
Distomum sp	Paralichthys dentatus	482
Distomum sp	Pomatomus saltatrix	451
Distomum sp	Prionotus carolinus	471
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Distomum sp	Rhombus triacanthus	454
Distomum (Köllikeria) sp	Scomberomorus maculatus	464
Distomum sp	Stenotomus chrysops	458
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Analytical key to the genera of Cestodes mentioned in this report.

1.	Scolex spherical or subspherical with cup-like bothria	1
2.	Scolex of various shapes, but unlike 1	2
3.	Scolex simple	*Tetrabothrium*
	Scolex with retractile appendages in front	*Phyllobothrium*
4.	Scolex mushroom shape without bothria	*Dibothrium cœcephalum.*
	Scolex provided with bothria	4
5.	Bothria two	*Dibothrium.*
	Bothria four	6.
6.	Bothria united into a discoidal or subglobular mass	7.
	Bothria distinct	8.
7.	Scolex discoidal	*Lecanicephalum.*
	Scolex subglobular with subglobular proboscis	*Tylocephalum.*
8.	Bothria unarmed	9
	Bothria armed	19.
9.	Bothria without auxiliary suckers	10.
	Bothria with auxiliary suckers	13.
10.	Bothria with costæ	11.
	Bothria without costæ	12.
11.	Scolex with myzorhynchus	*Echeneibothrium.*
	Scolex without distinct myzorhynchus	*Rhinebothrium.*
12.	Bothria in pairs, fan shape, with frilled or lobed border	*Spongiobothrium.*
	Bothria cruciform with entire margins	*Anthobothrium.*
13.	Two auxiliary suckers on each bothrium	*Oncomatobothrium*
	One auxiliary sucker on each bothrium	14
14.	Auxiliary suckers relatively large, formed from anterior part of bothrium	15
	Auxiliary suckers small, circular	16
15.	Auxiliary suckers entire, scolex with terminal haustellum	*Megagyngt.*
	Auxiliary suckers horseshoe shape, anterior ends of bothria partly retractile	*Calyptrobothrium.*
16.	Bothria in pairs	17.
	Bothria cruciform	18
17.	Scolex with terminal muscular disk	*Tetrabothrium*
	Scolex without terminal muscular disk	*Phyllobothrium.*
18.	Bothria slender pedicelled, with crenulate head	*Anthocephalum.*
	Bothria short pedicelled, border not crenulate	*Acanthobothrium*
19.	Bothria armed with hooks	20.
	Bothria provided with retractile spiny proboscid	24
20.	Hooks inconspicuous, of densely fibrous structure	*Diphyllobothrium*
	Hooks chitinous, structureless	21
21.	Hooks simple	22
	Hooks compound	23
22	Bothria without auxiliary suckers	*Onchobothrium*
	Bothria with auxiliary suckers, anterior to hooks	*Calliobothrium.*
23.	Scolex flattened, bothria in pairs, hooks in pairs united by a chitinous bar	*Platybothrium.*
	Bothria cruciform	24
24.	Hooks with two prongs each, bothria costate	*Acanthobothrium.*
	Hooks with three prongs each, bothria loculate at posterior end	*Phoreiobothrium.*
25.	Bothria two	*Rhynchobothrium*
	Bothria four	26
26.	Bothria each with an auxiliary pit	*Otobothrium*
	Bothria without an auxiliary pit	27
27.	Bothria lateral	*Pterobothrium*
	Bothria terminal	*Scyphobothrium*

Analytical key to the Distomes mentioned in this report.

	Body unarmed	1
	Body armed with spin	4
1.	With a more or less retractile caudal appendage	Table I
	Without a retractile caudal appendage	2
2.	Sexes separate. See *Distomum (Kolli* from Scyphomedusæ	
	Sexes united, hermaphroditic	3
3.	Head provided with lobes (*Bunodera*). See *Distomum cabalzari*	
	Head without lobes	4
4	Forks of intestine with lateral pouches or branches	Table IV
	Forks of intestine simple	5
5.	Œsophagus none or very short	Table II
	Œsophagus distinct	Table III.
6.	Mouth armed with spines	Table V.
	Mouth unarmed	7.
7.	Forks of intestine simple, testes normally two	Table VI.
	Each fork with an anteriorly directed branch from near base of œsophagus, testes numerous [*Pleorchis*]	*Distomum polyorchis.*

[1] The species referred in early papers to *Oxygmatobothrium angustum* has been placed in this paper in the genus *Crossobothrium*.

TABLE I. [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] (millimeters).	[illegible] (microns).	[illegible]	Other characters and [illegible]
D. ocreatum Molin.	About equal......	Two; one subglobular, the other, trilobed; transverse, middle of body.	Two; small, median, oblique, behind ventral sucker.	Globose; remote from testes at anterior margin of vitellaria	Variable, 1.26 to [illegible]	25x11	Forks extending [illegible]	[illegible] anterior edge of ven-[illegible]
D. appendiculatum Rudolphi.	Ventral about twice diameter of oral.	Two; small, ventral, right subglobular, left [illegible] lobed, toward [illegible]	Two; small, oblique near ventral sucker.	Subglobular, at anterior edge of vitellaria.	1.13........	27x14.......	Forks not extending into appendix.	[illegible] hind ventral sucker.
[illegible]	[illegible] exceeding oral	[illegible] a little way back of middle, transverse.	[illegible] verse at posterior edge of ventral sucker.	[illegible] at anterior edge of vitellaria.				[illegible] pouch anterior to [illegible]
D. monticellii Linton	Ventral 3 to 5 times diameter of oral.	Lobed, toward posterior end.	Two, globular, oblique halfway between ventral [illegible]	Globular, at [illegible] rior edge of vitellaria.				Body slender, often with transverse rugae.
D. grandiporum Rudolphi	Ventral 2½ to 3 times oral, or more.	Two, large, immediately behind ovary.	Two; globose, behind ventral sucker.	Large, globose, posteriorly placed.			Forks irregular in outline entering appendix.	[illegible] in [illegible] of [illegible]
D. gulosum sp. nov.	Nearly equal.....	Tubular, near middle of body, about 6 showing in section.	Two, smallish, subglobular, end to end behind seminal vesicle.	Globular, a short distance behind testes.	10 (life); 7.5 (alc.).	17x10	Forks extending into the long, slender appendix.	[illegible] anteriorly by fine striae; pharynx tubular, about as long as oral sucker.
D. tornatum Rudolphi.	Ventral much larger than oral.	Tubular, surrounding ovary, extending to testes.	Two, smaller than [illegible] and a short distance behind [illegible]	Subglobular, a short distance back of testes.	13.75, usually about 10.	22x17 (Coryphaena); 17x12 (Men[illegible]	[illegible] into appendix.	Integument semi-[illegible] lia conspicuou[illegible]
D. rufoviride Rudolphi.	Ventral twice diameter of oral	Two, multifid, on left side	Two; large, round at each side behind ventral [illegible]	....	5 to 9		Forks not reaching appendix.	[illegible] (4, p. [illegible]) appear to belong to D. torna-[illegible]
D. sp. from menti-[illegible]	Ventral about [illegible] of oral.	Two; slender, con-[illegible] to right and left of ovary.	Two, large, globu-[illegible] behind ventral sucker.	Globular, smaller [illegible] dian close behind testes.			[illegible] ing but not entering appendix.	[illegible] depressed; appendix [illegible]

TABLE II.—*Ecaudate distomes with œsophagus very short or none.*

Species.	Suckers.	Vitellaria.	Testes.	Ovary.	Size (millimeters).	Ova (micromm.).	Intestine.	Other characters and remarks.
D. vibex Linton ...	Ventral much larger than oral.	Lateral and posterior extending forward to ventral sucker.	Two; lateral behind ventral sucker and in front of folds of uterus.	Subglobular, in front of testes, dorsal	1.25 to 6	59x29	Forks extending to posterior end	Body thick, convex above, neck concave beneath, genital aperture behind pharynx.
D. fecundum Linton.	Ventral much larger than oral, aperture transverse.	Dorso-lateral from posterior end to ventral sucker not abundant	Two, transverse near posterior end.	Dorsal to and projecting in front of testes, transverse diameter greatest.	2.7	38x17 to 43x17; very numerous	To	Body bluntly rounded in front, squarish posteriorly, thick
D. sp. from Raja lævis (figs. 224, 225).	Ventral much larger than oral, aperture longitudinal	Two lateral clusters of small dark bodies beside the testes.	Two; lateral, side by side, near posterior end.	Smaller than testes, in front of them, to the right, apparently two-lobed.	7.5	86x45; few		General habit of body much as in D. fecundum
D. sp. from Gasterosteus bispinosus. Probably belongs here (fig. 226).	Ventral twice the diameter of oral.	Behind ventral sucker, lateral and at posterior end.	Two, lateral near posterior end.	.....	.....	.....	.....	
D. cochlivoloron Olsson.	Ventral about twice the diameter of oral.	A single 6 or 7 lobed mass, lateral to ventral posterior end.	Two; rather small, elliptical, immediately behind ventral sucker	On left side in front of vitellaria.	.87 .8	20x13; very numerous 17x10; very numerous	Forks extending to posterior end	Body conspicuously short-pustulose.
D. sp. B (*a*) from Opsanus tau. (fig. 203).	Ventral larger than oral	Scattered masses, posterior and marginal not quite to ventral sucker	Two; globular, median at about posterior third.	Globular, at anterior edge of front testis, to right	1.21	.....	Forks thin-walled, undulated, extending to posterior end	See text
D. sp. B (*b*) from Opsanus tau. (fig. 204).	.....do.....	Crowded granular masses posterior and marginal to pharynx.	Two; on median line at posterior third, broader than long.	.....do.....	.88	45x24	Forks slender, thick-walled, to posterior end.	See text

TABLE III.—*Ecaudate distomes with distinct œsophagus.*

		Vitellaria.	Testes.	Ovary.	Size (millimeters).	Ova (microns).	Intestine.	
D. simplex Rudolphi.	Ventral twice diameter of oral.	Numerous, relatively [illegible] base, from posterior laterally to ventral sucker.	Two; large, median, [illegible] end.	In front of anterior testis somewhat three-lobed on posterior edge.	3 to 9	80x40	Forks extending to [illegible]	[illegible] pharynx.
[illegible] ton.	[illegible] as much as three times diameter of oral.	Numerous, large, subangular, posterior and lateral to ventral sucker.	Two; large, median, approximate, near posterior end.	In front of anterior testis, a little to right.	1.1	50x30	.....do	[illegible] sucker; [illegible] aperture in front of [illegible] to left, aperture of [illegible] undulate or lobed.
D. pudens Linton..	Ventral usually somewhat larger [illegible]	Numerous, small bodies, posterior and lateral to pharynx.	Two; rather large, median, approximate, toward posterior end.	Globular, much smaller than testes, at anterior edge of front testes, to right.	3.7	55x35	Forks extending to posterior end of body.	[illegible] shorter than [illegible] to mouth of ventral sucker, [illegible]
D. pallens Rudolphi.	Ventral about [illegible] of oral.	Numerous, globular minute; lateral in posterior half of body.	Two; large, elliptical, median, behind folds of uterus.	Globular, in front of testes.	3.1	67x34	"Forks extending to posterior end."	"Body oblong, subdepressed, rounded [illegible]
D. globiporum Rudolphi.	About equal.....	Fill posterior part of body back of testes [illegible] ventral sucker.	Two; median, about middle of [illegible]	Close behind cirrus pouch, to right, [illegible] testes.	1.35	71x50	Forks extend to posterior end.	Agrees with description of this species, except that œsophagus is not longer than pharynx.
D. sp. from Paralichthys dentatus (fig. 228) and D. sp. from Rhombus [illegible] (fig. 229).	[illegible]	At posterior end, and lateral as far as ventral sucker or in front of it.	Two; subglobular, median, approximate, toward posterior.	Globular, in front of testis, on median line, or a little to right.	1.19	52x31 ...	....do	Figure of D. pudens; œsophagus longer than pharynx in both.
					1.46	75x58 ..... as D. bothryophoron.	....do	
D. sp. from Menidia notata.	Ventral about two-thirds diameter of oral.							Body fusiform, like D. bothryophoron, but neck more slender.
Distomum sp. from Limanda ferruginea [illegible]	Ventral [illegible] diameter.	Lateral from testes to pharynx.	Two; rather large, diagonal at posterior end.	Smaller than testes, subglobular or slightly two-lobed in front of anterior testes, to right.	2.57	65x41	Forks extend to ovary.	Body, fusiform.
D. [illegible]	Ventral [illegible] lateral diameter.	Very abundant at posterior end, lateral and dorsal to and in front of ventral sucker.	Two; median, approximate, near posterior end.	Subglobular, immediately in front of anterior testis, a little to the right.	1.78 to 4.2	69x38	Forks extending nearly to posterior end.	Body slender, fusiform [illegible] œsophagus much longer than pharynx.

TABLE IV.—*Unarmed distomes with intestinal rami branched or saccate.*

Species.	Suckers.	Vitellaria.	Testes.	Ovary.	Size (millimeters).	Ova (microns).	Intestine.	Other characters and remarks.
D. macrocotyle Duesing.	Ventral twice diameter of oral.	In neck and as far back as ovary.	Two, oval, ventral, one behind the other.	Back of posterior testes, halfway between ventral sucker and posterior end.	14 (alcoholic).	26x17.....	Anastomosing vessels in front saccate and dark colored in body, extending to tail.	Body round, curved, linear fusiform, neck conical, reflexed, genital aperture near oral sucker.
D. velhportum Crepl in.	Ventral much larger than oral.	Lateral not extending to posterior end of intestine.	Two; median approximate, in front of forks of excretory vessels behind folds of uterus.	In front of testes, a little to right.	20, 50 to 80..	76x6.		Body depressed, long, transversely toughened, genital aperture at posterior margin of pharynx.
D. clavatum Rudolphi.	Ventral more than twice diameter of oral.	In middle of body, apparently in small tubular or thread-like folds.	Two; close behind ventral sucker.	Immediately following testis.	18 (alcoholic).	34x24	Anastomosing vessels in neck, saccate and dark colored in body, to tail.	Body cylindrical, posteriorly thickened genital aperture midway between suckers.
D. lageniforme Linton.	Ventral much larger than oral.				20 (life); 7.5 (elite, contracted	...		Genital aperture just back of mouth; body depressed, contracting to subglobular shape; neck concave below.

TABLE V.—*Distomes with body more or less covered with spines and mouth armed with spines.*

Species.	Suckers.	Vitellaria.	Testes.	Ovary.	Size (millimeters).	Ova (microns).	Intestine.	Other characters and remarks.
Distomum tenue Linton.	Ventral larger than oral.	Abundant, peripheral in posterior region, lateral to ventral sucker.	Two; subglobular median, toward posterior end of body.	Globular in front of testes.	2.9	88x41	Forks extending nearly to posterior end.	Pharynx large remote from head, no œsophagus; double row of 21 spines each around mouth.
Distomum tenue var. tenuissime Linton.	Ventral nearly twice oral.	Voluminous in posterior two-thirds of body, obscuring other organs.	Two, rather large in posterior third of body.	Subglobular, in front of testes.	1.0	96x88, 104x56		Slender, linear, spines evanescent both on body and around mouth.
Distomum dentatum Linton.	Ventral much larger than oral.	Very abundant, as in D. tenue, but extending into neck.	Two, large, median, approximate, at posterior third of body.	Subglobular, triangular in outline, close in front of anterior testis.	1.87	70x40	Forks extend to posterior end of body.	Relatively broader, more depressed, and smaller than D. tenue; 24 spines in each oral circle.
Distomum valdeinflatum Stossich.	Ventral larger than oral.							Only immature forms in cysts seen.

TABLE VI.—*Distomes with bodies more or less covered with spines, mouth unarmed.*

[illegible]	[illegible]	[illegible]	Testes.	Ovary.	[illegible] (mm.).	Ova (microns).	[illegible]	Other characters and re-[illegible]
[illegible] tum Rudolphi.	[illegible]	Lateral and dorsal, [illegible] end to testes.	Two; approximate, slightly back of ventral sucker, a little to left.	[illegible] testis, to the [illegible]	12 (alcoholic).	[illegible]	Forks thick walled, extending to posterior end.	Spines thick and tuber[illegible]
[illegible] flavum Ru-[illegible]	Ventral larger than oral, [illegible]	[illegible] betw. ovary and [illegible]	Two; elliptical, about middle of [illegible]	A short distance be-[illegible] testis.	.5 (alco-[illegible]	[illegible]	[illegible] extending to pos-[illegible]	Spines deciduous.
[illegible] tum Linton.	Ventral larger [illegible]	[illegible] to oral sucker abundant in neck.	Two; oblong, near middle of post-[illegible]	A short distance back of posterior [illegible]	16 (alcoholic).	[illegible]	Forks irreg., dark colored, reaching [illegible]	Dorsum of neck with several transverse crests.
[illegible]	Ventral larger [illegible]	[illegible] of body.	Two [illegible] middle of body.	[illegible]	5.5 (alcoholic).	[illegible]	[illegible]	Cirrus-pouch in front of [illegible]
[illegible] Cobbold.	Oral larger [illegible]	[illegible]	Two [illegible] dian, a little back of middle.	Globular, in front of anterior testis.		70x40	Forks reaching to [illegible]	[illegible] on neck, slender and scattering back of ventral sucker.
[illegible] tum Rudolphi.	Oral a little [illegible] ventral.	Posterior and lateral to and a lit-[illegible]	Two [illegible] middle of body.	Subglobular, in front of testes, to the left.	[illegible]	110x70	[illegible] nearly to posterior end.	There is a vitelline reservoir between testes and ovary.
[illegible] forme Linton.	[illegible]	Filling body posterior and lateral to and in front of [illegible]	Two; median, approximate, near posterior end.	[illegible] right, in front of [illegible]	0.16 to 0.57.	55x31	[illegible] terior end.	Very variable in shape.
[illegible] chrysops (7, p. [illegible]	About equal.	Marginal from posterior end to ven-[illegible]	[illegible] back of middle, [illegible]	[illegible] in front of anterior testis.	0.62 to 1..	[illegible]	Forks spacious, extending to posterior end.	[illegible] also Distomum sp. (4, [illegible]
Distomum sp. from [illegible]	[illegible]	[illegible] eral to ventral sucker.	Two; globose, median, approximate, back of middle.	[illegible] anterior testi and ventral suc-er to right.	2.72 (for-[illegible]	[illegible]	[illegible] nearly to posterior [illegible]	[illegible] very minutely spinose, spines very easily over-[illegible]
[illegible] Enchelyopus [illegible]	Ventral somewhat larger [illegible]	[illegible] ted back of ventral sucker, espe-[illegible]	[illegible] in posterior half of body, not approximate.	Globular, close in front of anterior [illegible]	3.62 (alcoholic).	70x40	[illegible] near posterior end.	[illegible] that spines; œsophagus equals pharynx.
Distomum sp. from Opsanus tau (species A, figs. 201, 202).	About equal...	Abundant; posterior and lateral to ventral sucker in larger, to phar-[illegible]	Two; median and [illegible] terior somewhat [illegible]	Subglobular, near posterior edge of [illegible] the left.	3.6, 1.1...	100x70 ..	[illegible] nearly to posterior end.	[illegible] like spines easily overlooked.
Distomum sp. from Stolephorus [illegible]	Ventral larger than oral.	Two, subglobular, dorsal and posterior to ventral [illegible]	Not distinctly seen, but near vitellaria, apparently [illegible]	Globular, about on [illegible] laria, not distinctly seen.	1.73	21x11, filling median and posterior of body.	Could not be traced back of ventral sucker in these [illegible]	[illegible] remote from the mouth. [illegible]
[illegible]	[illegible] oral.	Posterior and lateral to ventral [illegible]	[illegible] rior globose, pos-[illegible]	Small, globular, median, in front of anterior testis.	3 to 6	86x55 .	[illegible] to posterior end not made out in these specimens.	Neck clothed with coarse spines, body with smaller [illegible]

Index of fishes mentioned in this report.

Index of fishes mentioned in this report—Continued.

LIST OF PAPERS REFERRED TO BY NUMBER IN THE TEXT.

1. Notes on Entozoa of Marine Fishes of New England, with descriptions of several new species. Report of Commissioner of Fish and Fisheries for 1886. Washington, 1889.
2. Notes on Entozoa of Marine Fishes of New England. Part II. Report of Commissioner of Fish and Fisheries for 1887. Washington, 1890.
3. Notes on Entozoa of Marine Fishes. Part III, Acanthocephala. Report of Commissioner of Fish and Fisheries for 1888. Washington, 1891.
4. Notes on Larval Cestode Parasites of Fishes. Proceedings of United States National Museum. Vol. XIX. Washington, 1897.
5. Notes on Cestode Parasites of Fishes. Proceedings of United States National Museum. Vol. XX. Washington, 1897.
6. Notes on Trematode Parasites of Fishes. Proceedings of United States National Museum. Vol. XX. Washington, 1897.
7. Fish Parasites collected at Woods Hole in 1898. Bulletin of the United States Fish Commission for 1899. Washington, 1900.

SUMMARY OF FISH PARASITES ARRANGED UNDER THEIR HOSTS.

Mustelus canis, *Smooth Dog-fish.*

FOOD.

The alimentary canals usually contain crabs (*Panopeus, Platyonichus, Cancer, Libinia*, etc.). Squid, annelids, and fish have also been noted.

NEMATODES.

1. *Ascaris* sp. [Pl. IX, fig. 90.]

Two imperfect specimens in U. S. National Museum collection apparently removed from peritoneal capsules. Dimensions in millimeters: Length, 23; diameter of head, 0.12; maximum diameter a little back of middle, 0.45; distance of anal aperture from posterior end, 0.15. Head with three short lips, two bluntly angled, the third rounded. Body transversely rugose; posterior end bluntly rounded with a mucronate tip which is conical and wrinkled.

CESTODES.

2. *Dibothrium* sp. Spiral valve. **5**, p. 433.
3. *Calliobothrium verticillatum* Rudolphi. Spiral valve. **1**, pp. 476–479, pl. IV, figs. 1–8. **2**, pp. 810–812. **5**, p. 447, pl. XXXIV, figs. 6, 7. **7**, p. 270. Aug. 14, 1899; from two hosts, 25 large, 9 small. Aug. 28, 1899; from one host, 8. July 18, 1900; from one host, 63.

Ripe proglottides noticed on one occasion upon which apertures for discharge of ova had developed. These were arranged along the median line of one of the flat surfaces and numbered about five in most cases, although as many as eight were counted. When the proglottis was viewed from the margin these apertures were seen to be slightly projecting. [Pl. XXVI, fig. 289, *a* and *b*.]

4. *Calliobothrium eschrichtii* Beneden. Spiral valve. **2**, pp. 812–816, pl. VII, figs. 5–12. **5**, p. 447. Aug. 14, 1899, 1.
5. *Rhynchobothrium lomentaceum* Diesing. Spiral valve. **2**, pp. 845–847, pl. XIII, figs. 1–3.
6. *Rynchobothrium bulbifer* Linton. Spiral valve. **1** [*R. tenuicolle* Rudolphi], pp. 486–488, pl. V, figs. 17, 18. **2**, pp. 825–829, pl. X, figs. 8, 9, and pl. XI, figs. 1, 2. **5**, p. 448. **7**, p. 270. July 26, 1899; from two hosts, 22. Aug. 14, 1899; from two hosts, 12. Aug. 28, 1899; from one host, 3.
7. *Rhynchobothrium tumidulum* Linton. Spiral valve. **2**, pp. 829–832, pl. XI, figs. 3–11. **5**, p. 448. **7**, p. 270. July 18, 1900; from one host, 6.
8. *Rhynchobothrium heterospine* Linton. Spiral valve. **2**, pp. 839–840, pl. XII, figs. 3–5.
9. *Rhynchobothrium* sp. Blastocyst, stomach. **1**, p. 798, pl. LXIV, fig. 2.
10. *Tetrarhynchus* sp. Cysts, stomach-wall. **1**, p. 809, pl. LXVI, figs. 6, 7.
11. *Synbothrium filicolle* Linton. Cysts, stomach-wall. **1**, pp. 815, 819, 820, pl. LXVIII, fig. 9.

Galeocerdo tigrinus (*Galeocerdo maculatus*), *Tiger Shark.*

FOOD.

The stomach may contain a great variety of objects (**7**, pp. 270–271), but fish, univalve mollusks, and squid probably constitute the principal food. The single specimen examined in 1899 had been kept in confinement for two or three weeks and had nothing in the alimentary canal except two opercula of the winkle (*Sycotypus canaliculatus*), feathers of a flicker, and some green seaweed in the intestine. In the specimens examined in 1887 fragments of menhaden, bonito, and opercula of the winkle were noted.

NEMATODES.

1. *Ascaris brevicapitata* sp nov.; stomach. [Pl. III, figs. 19–22.]

Four specimens collected August 3, 1889, and a single specimen belonging to the National Museum collection are of nearly uniform diameter for the greater part of their length, but are attenuate anteriorly, particularly so for about 5 mm. at the anterior end; greatest diameter near posterior end, which is recurved. Longest female 102 mm. in length and 1 mm. in diameter; body marked with regular annulations about 0.008 mm. in length; œsophagus linear; spicules of male long and slender; about 8 postanal and 30 or more preanal papillæ on each side; jaws very short and provided with papillæ. Dimensions of a male in millimeters: Length, 70; diameter of head, 0.17; length of head, 0.08; diameter of body one mm. back of head 0.56, one mm. from posterior end 0.75, at anal aperture 0.37, maximum diameter 1.25; distance of anal aperture from posterior end, 0.51.

2. *Acanthocheilus nidifex* Linton. Stomach. **7**, pp. 270, 271, 303, pl. XXXIII, figs. 116–119. 1899, from one host, 3 in pits of mucous membrane of stomach. Ova, kept in sea water, which on August 20 showed only early stages of cell division, on August 23 contained active embryos.

CESTODES.

3. *Oxygmatobothrium paulum* Linton. Spiral valve. **5**, p. 444, pl. XXXIII, figs. 7, 8.
4. *Thysanocephalum crispum* Linton. Spiral valve. **1** [*Phyllobothrium thysanocephalum*], pp. 464–468, pl. II, figs. 1–12. **2**, pp. 823–824. **3**, pp. 543–556, pls. LXI–LXVII. **5**, p. 448. **7**, p. 271. See also **1**, p. 792, pl. LXII, figs. 10–11, for mention of larva from the squid. Aug. 19, 1899; from one host, 113, large and small.
5. *Monorygma* sp. Spiral valve. **7**, p. 271. See No. 3 under *Isurus dekayi*.
6. *Tetrarhynchus bicolor* Bartels. Stomach. **1**, p. 813–815, pl. LXVIII, figs. 1–6. **7**, p. 271. Aug. 19. 1899, several attached to and penetrating the stomach wall.

Carcharinus milberti, *Blue Shark.*

(Incorrectly referred to *Prionace glauca* in paper cited below.)

FOOD.

Two small specimens, 4½ feet long, taken August 5, 1889. Stomachs contained half-digested fish (bonito). A specimen taken off Gay Head by the schooner *Grampus*, July 30, 1900, and examined by Mr. C. W. Stone, was reported to have had fish of different kinds in the stomach, one of which was a flounder. This specimen measured 9½ feet.

NEMATODES.

1. *Immature nematodes.* Spiral valve. Embryonic cuticle still partly adhering. Specimens probably introduced with food, July 30, 1900.

CESTODES.

2. *Anthobothrium laciniatum* Linton. Spiral valve. **2**, pp. 754–759, pl. III, figs. 10–13; pl. IV, figs. 1–3. **5**, p. 439. July 30, 1900, 4, very small.
3. *Crossobothrium angustum* Linton. [*Oxygmatobothrium angustum* Linton.] Spiral valve. **1**, pp. 468–469, pl. III, figs. 1–3. **2**, pp. 796–799, pl. VII, fig. 3. **5**, p. 443.
4. *Monorygma* sp. Spiral valve. July 30, 1900, 27, small. See remarks on No. 3, under *Isurus dekayi*.
5. *Phoreiobothrium lasium* Linton. **1**, pp. 474–476, pl. IV, figs. 24–29. **2**, pp. 819–820. **5**, p. 447. **7**, pp. 272–273.
6. *Platybothrium parvum* sp. nov. Spiral valve, July 30, 1900, 253.

Probably the same species mentioned in **7**, p. 300, pl. XXXII, figs. 98, 99. The hooks are identical and should have been selected as a generic character. The bothriaare provided with two costæ on the posterior end and an auxiliary sucker in front of hooks. Neck elongated and densely spinose. The bothria in these specimens differ from any of the genus seen before in that they are trough-shape, the head thus bearing a strong superficial resemblance to *Phoreiobothrium*. The ripe segments are elliptical and loosely attached, making a moniliform chain. Longest specimens, 10 to 15 mm.

Dimensions of one of the larger specimens in millimeters: Length, 15; length of head, 0.54; breadth of head in front, 0.41; diameter of neck immediately behind the head, 0.11; length of last segment, 0.67; breadth, 0.47. The first distinct segments began about 5 mm. back of head.

7. *Rhynchobothrium tenuispine* Linton. Spiral valve. **2**, pp. 837–838, pl. XII, figs. 1, 2. **5**, pp. 448–449, pl. XXXIV, fig. 8.

Carcharinus obscurus (*Carcharias obscurus*), *Dusky Shark.*

FOOD.

Fish, among which menhaden and squeteague have been recognized. The stomach of a specimen examined August 1, 1899, contained a large quantity of oil in globular masses about the size of average peas. All the specimens examined in 1899 and 1900 were small—4½ to 5 feet.

ACANTHOCEPHALA.

1. *Echinorhynchus agilis* Rudolphi. Spiral valve. **1**, pp. 490–492, pl. V, figs. 1–6.

CESTODES.

2. *Discocephalum pileatum* Linton. Spiral valve. **2**, pp. 781–787, pl. x, figs. 1–7. **7**, p. 272. Rare; heads buried in mucous membrane of spiral valve; difficult to remove without breaking.
3. *Anthobothrium laciniatum* Linton. Spiral valve. **2**, pp. 754–759, pl. III, figs. 10–13, and pl. IV, figs. 1–3. **7**, p. 272. July 17, 1899; from one host, 1. July 22, 1899; from one host, 1. Aug. 1, 1899; from one host, 150. Aug. 21, 1899; from one host, 53. Aug. 25, 1899; from one host, numerous. July 20, 1900; from one host, 7.
4. *Crossobothrium angustum* Linton. [*Oxygmatobothrium angustum* Linton.] Spiral valve. **1**, pp. 468–469, pl. III, figs. 1–3. **2**, pp. 796–799, pl. VII, fig. 3. **7**, p. 272. July 22, 1899; from one host, 11. Aug. 1, 1899; from one host, 12. Aug. 25, 1899; from one host, 3. July 20, 1900; from one host, 24.

Among the specimens collected in 1900 two types were represented, one elongated, very slender, almost hair-like, attaining a length of 30 mm. with elongated and squarish segments; the other much shorter with moniliform segments beginning 10 mm. back of head. The generic name *Oxygmatobothrium* must be discontinued for this form. It and *Crossobothrium*, probably, are generically the same i. e., bothria cruciformly arranged, each with a single auxiliary acetabulum. The latter does not resemble anterior end of bothrium of *Monorygma*. Of frequent occurrence, sometimes abundant.

5. *Phoreiobothrium lasium* Linton. Spiral valve. **1**, pp. 474–476, pl. IV, figs. 24–29. **2**, pp. 819–820. **7**, p. 272. Aug. 11, 1899; from one host, 50. Aug. 21, 1899; from one host, 146. Aug. 25, 1899; from one host, numerous. July 20, 1900; from one host, 3.
6. *Phoreiobothrium triloculatum* sp. nov. Spiral valve. [Pl. XXVI, fig. 292.] Aug. 11, 1899; from one host, 10. Aug. 25, 1899; from one host, few. July 20, 1900; from one host, 16.

Head larger than that of *P. lasium*. The most striking difference is in the posterior ends of bothria, each of which has three loculi (arranged in a transverse row) instead of the numerous small loculi characteristic of *P. lasium*. Dimensions of a specimen in sea water, in millimeters: Length, 25; length of head, 0.71; breadth of head, 0.76; thickness of head, 0.63; breadth of neck, 0.36; thickness of neck, 0.13; distance to first distinct segment, 4.5; length of last segment, 3; breadth, 0.78.

7. *Platybothrium cerrinum* Linton. Spiral valve. **2**, pp. 820–823, pl. VIII, figs. 8–10, and pl. IX, fig. 1.
8. *Tetrarhynchus bisulcatus* Linton. **1** [*Rhynchobothrium bisulcatum*], pp. 479–486, pl. IV, figs. 9–23. **2**, pp. 857–861, pl. XIV, figs. 10–12, and pl. XV, fig. 1. **5**, p. 452. **7**, p. 272. Sometimes very abundant in the pylorus, the heads often embedded in the mucous membrane.
9. *Tetrarhynchus bicolor* Bartels. **4**, pp. 813–815, pl. LXVIII, figs. 5, 6.
10. *Tetrarhynchus* sp. Cysts, stomach wall. **4**, pp. 807–808.
11. Cysts containing degenerate connective tissue sometimes found in the walls of alimentary tract.

TREMATODES.

12. *Gasterostomum arcuatum* Linton. Spiral valve. July 22, 1899; from one host, 5 larger, with ova, 3 smaller.

Length of larger, 3.29 mm., very changeable, especially the anterior part. Translucent white except back of middle where the color is yellow on account of the ova. The alcoholic specimens are arcuate; their slender necks densely clothed with flat spines, which continue to the posterior end. On the posterior half of the body they are less dense and arranged in transverse series. Ova 0.021 and 0.014 mm. in the two principal diameters. These specimens agree with those from the bonito in all essential characters. The only point of difference noted is that the number of vitellaria does not appear to be quite so definite in these as in the specimens from the bonito. Their arrangement, however, is the same, and the number does not vary greatly from that given in the original description, viz, 32. See **7**, pp. 297–298, pl. XLI, figs. 85–90.

Sphyrna zygæna, *Hammerhead.*

FOOD.

Fish and squid.

NEMATODES.

1. *Spiroptera pectinifer* sp. nov. Stomach. [Pl. XV, figs. 197, 198; pl. XVI, fig. 199.]

Two nematodes, a male and a female, collected July 18, 1887, are here recorded. Mouth terminal, aperture round, two small lateral papillæ on head. Tail in each coiled in a close spiral. Spicules in

male apparently equal. Anal aperture transverse with a chitinous toothed plate on its posterior border. Preanal papillæ, as seen on left side, about 24, arranged somewhat in groups of three; on right side they appear to be fewer and larger; postanal papillæ, 10 seen on left side and 7 on right, with 6 nearly median near the tip. Dimensions in millimeters: Male, length, 16.5; diameter of head 0.11, 1 mm. from anterior end 0.36, maximum 0.56, 1 mm. from posterior end 0.47, at anal aperture 0.27; distance of anal aperture from posterior end, 0.27; length of œsophagus, 1.8. Female, length, 30; diameter of head 0.13, 1 mm. from anterior end 0.42, maximum 0.86, 1 mm. from posterior end 0.71, at anal aperture 0.28; distance of anal aperture from posterior end, 0.28; length of œsophagus, 2.

2. *Ichthyonema* sp.

From liver, collected by Dr. Howard Ayers, August 17, 1889. The specimen is the posterior end of a female, 108 mm. in length and 0.7 mm. in diameter and tapering at posterior end.

3. *Immature nematodes.* [Pl. XIV, figs. 183–184.]

Fragment from intestine, July 28, 1886, evidently introduced with food; length, 15 mm.; diameter, 0.45 mm.; still inclosed in hyaline embryonic cuticle; posterior end bluntly rounded; diameter nearly uniform, irregularly interrupted by indentations. July 31, 1899; small fragment from intestine.

CESTODES.

4. *Aathobothrium laciniatum* Linton. Spiral valve. July 31, 1899; from one host, 4. Not recorded before from this host. See under *Carcharinus obscurus*, No. 3.

5. *Phoreiobothrium lasium* Linton. Spiral valve. **7,** p. 273. See under *Carcharinus obscurus*, No. 6. July 31, 1899; from one host, 4.

6. *Platybothrium parcum* sp. nov. Spiral valve. **7,** pp. 273 and 300, pl. XLII, figs. 98, 99. July 31, 1899; from one host, 2. See under *Carcharinus milberti*, No. 6.

7 *Otobothrium crenacolle* Linton. Spiral valve. **2,** pp. 850–853, pl. XIII, figs. 9–15, and pl. XIV, figs. 1–4. **7,** p. 273.

8. *Tetrarhynchus.* Encysted in intestinal wall. **1,** p. 808.

9. *Tænia* sp. [Pl. XXV, figs. 274–281; pl. XXVI, fig. 282.]

July 31, 1899; several attached to mucous membrane of intestine. About a dozen were attached firmly, their heads embedded in the intestinal wall within a space about 10 mm. square. Specimens not measured when first taken. The alcoholic specimens are not in good condition, being rather fragile. Dimensions of two specimens, in millimeters: Length, 14 and 24; diameter of head, 0.86 and 0.70; diameter of neck, 0.60 and 0.50; length of last segment, 0.50 and 0.70; breadth of last segment, 2 and 2.40; diameter of suckers, 0.34 and 0.22. Length of a free segment, 8.5; breadth, 2.5. Some of the ova nearly circular in outline, with the diameter 0.17; others ovate with maximum diameter as much as 0.22; one 0.17 and 0.21 in the two principal diameters. Cirrus long, armed with hooks; length of hooks, 0.014. This species suggests *Tænia gibbosa* Leidy, from a species of *Lamna* inhabiting the Pacific coast of North America.

Alopias vulpes, *Thrasher.*

The viscera of one specimen were examined July 6, 1887, but no entozoa were found. Another, examined August 20, 1900, had remains of small fish in the intestine. No entozoa found.

Carcharias littoralis (*Odontaspis littoralis*), *Sand Shark*

FOOD.

Fish (menhaden, sea bass, scup, and butter-fish noted) and squid.

ACANTHOCEPHALA.

1. *Echinorhynchus carchariæ.* **3,** pp. 536–537, pls. LIX, LX, figs. 81–84.

2. *Echinorhynchus acus* Rudolphi. Aug. 12, 1899, from one host 1. Spiral valve. Probably introduced with food. **7,** p. 273.

NEMATODES.

3. *Acanthocheilus* sp. Stomach. July 21, 1899, from one host 3; Aug. 9, 1899, from one host 1; Aug. 12, 1899, from one host 1.

These worms are rather plump, thickest in the middle and tapering equally to each end. Length, 34 to 44 mm.; diameter reaching 2 mm. Mouth provided with three minute lips. No males seen.

4. *Ascaris* sp. [Pl. XI, figs. 127–130.]

A few specimens found in the intestine on different occasions, immature, most of them certainly young ascarids. They have evidently been introduced with the food and probably would not develop further in this host. The specimen shown in figs. 127–128 was collected August 2, 1886. Length, 17 mm.; maximum diameter from middle to posterior third of body, 0.57 mm.; body crossed with transverse striæ; wall of intestine tessellated. Figs. 129–130 show an immature female, length, 50 mm.; diameter, middle to posterior fifth, 1.6 mm.

CESTODES.

5. *Crossobothrium laciniatum* Linton. Spiral valve. **1**, pp. 469–474, pl. III, figs. 4–18. **2**, pp. 799–802, pl. VII, fig. 4. **5**, pp. 445–446. **7**, p. 273.

July 17, 1899; 20. July 21, 1899; several. Aug. 9, 1899; numerous. Aug. 12, 1899; 2. Aug. 15, 1899; 1. In this specimen the stomach was empty, the intestine contained a viscid mucus and there was a diseased patch of mucous membrane at pyloric end of stomach, the surface being caked and hard. Aug. 17, 1899; 4. Aug. 18, 1899; 55, large and small. Aug. 19, 1899; 12. July 20, 1900; 47 from one and 16 from another, young and adult. Two small worms in this lot present some points of difference from the young of this species with which they were associated. Bothria provided with an auxiliary acetabulum as in *Crossobothrium* but smaller, more slender, and less mobile; body slender, with apparently true proglottides, which were elongated and without any indication of laciniæ. Habit of worm like that of form heretofore called by me *Orygmatobothrium angustum*. Aug. 12, 1900; numerous. Aug. 13, 1900; 106, young and adult, with numerous free, ripe proglottides.

Dr. Dahlgren reports that many sand sharks have been opened this season (July–August, 1900) to supply material for work on cestodes in the Marine Biological Laboratory, and that this species has been found in great abundance in all of them. This species may be identical with *Tetrabothrium barbatum* Leidy. Fig. 235 is a sketch of the posterior end of a young strobile which appeared to be dividing into four by the abnormal enlargement of the laciniæ.

6. *Rhynchobothrium longicorne* Linton. Spiral valve. **2**, pp. 847–849, pl. III, figs. 4–8. **5**, p. 450. Aug. 9, 1899; 4.

7. *Rhynchobothrium*. Encysted in walls of stomach and intestine. **4**, p. 798. Aug. 18, 1899; blastocyst from cyst in stomach wall.

Isurus dekayi, *Mackerel Shark.*

FOOD.

One specimen, taken by the schooner *Grampus*, July 30, 1900, had a conger eel and fragments of fish in the stomach. Entozoa collected by Mr. C. W. Stone, in formalin when examined.

NEMATODES.

1. *Immature nematodes*. Intestine.

Few, small; length of largest, 12 mm. Same type frequently found in a great variety of fish. A diverticulum from base of proboscis and another from anterior end of intestine.

CESTODES.

2. *Anthobothrium laciniatum* Linton. Spiral valve. Not recorded before from this host. See under *Carcharinus obscurus*, No. 3.

These individuals, 5 in number, are smaller than specimens from the dusky shark. Dimensions in millimeters: Length, 5; breadth of head, 0.61; length of head, 0.34; diameter of neck, 0.09; distance of first segment from head, 0.36; last segment, length 0.58, breadth 0.43.

3. *Monorygma* sp. Spiral valve. Twelve specimens, all very small and identical with No. 4, under *Carcharinus milberti*.

The heads of the living worms were not seen, and it is difficult to determine the exact nature of the contracted specimens. There appears to be a myzorhynchus and the character of the acetabulum seems to be quite different from that of the species I have been erroneously calling *Orygmatobothrium angustum*. The auxiliary acetabulum of the latter resembles that of *Crossobothrium* and of *Phyllobothrium*. In the case of these specimens the auxiliary acetabulum is relatively larger than in the genera just named and appears to be simply the anterior part of the bothrium separated by a transverse partition.

The resemblance of head to that of *Monorygma chlamydoselachi* Lönnberg is very striking. The neck is minutely serrate in outline. The ripe segments are very easily detached. Some free segments which probably belonged to this species were much larger than the dimensions of the last segment given below. Dimensions of one in millimeters: Length, 3.77; length of head, 0.35; breadth of head, 0.42; diameter of neck, 0.15; distance to first segment, 1.6; last segment, length, 0.65; breadth, 0.17. Similar forms found in *Galeocerdo* and *Isurus*.

4. *Thysanocephalum ridiculum* sp. nov. Spiral valve. [Pl. XXVII, figs. 294, 295.]

A few very small specimens with scolices which agree in minute detail with the head proper of *T. crispum*, but without the characteristic pseudoscolex of that species, were found. The head is quadrangular, the bothria oblong, each of the four with two short, conical hooks, which are the lateral prolongations of a transverse partition. The structure of these hooks is entirely different from that of the ordinary chitinous hooks of cestodes and acanthocephala. It appears to be of the same essential nature as the thickened borders of the bothria, but denser. This has already been shown for *T. crispum* (Report of U. S. Fish Commission for 1888, p. 547, pl. LXII, fig. 13). Back of the hooks the bothria are somewhat trough-shaped. In front of the hooks the bothria are prolonged in some, short in others. The contraction states are more variable in the anterior than in the posterior parts of the bothria. The anterior portion evidently has suctorial functions. It has the appearance of a distinct loculus in contraction. The strobiles are short, the proglottides rather irregular, easily detached, posterior ones elliptical, making the chain moniliform in outline. Dimensions in millimeters: Length, 3.36; diameter of head at hooks, 0.72; in another, 0.26; length of bothrium, 0.75; in another, 0.44; breadth of bothrium, 0.50; in another, 0.17; length of hooks, 0.06; diameter of neck 0.25, swelling to 0.46 at 0.29 from head; in another, 0.14, swelling to 0.20 at 0.14 from head.

5. *Platybothrium parvum* sp. nov. Spiral valve.

These specimens, of which 57 were found, are identical with No. 6 under *Carcharinus milberti*. Upon superficial examination one would be disposed to place them in the genus *Phoreiobothrium*. The character of the hooks, however, is unmistakable. The longest specimens measure about 10 mm. They are not in good condition for measuring, being more or less coiled up. The segments drop off very easily. A few retained, six in one case, give to the strobile a characteristic moniliform appearance. In such cases the segments may be a little longer than broad, as long as broad or broader than long. For further details of this species, see under *C. milberti*, No. 6.

6. *Tetrarhynchus robustus* Linton. Scolex, spiral valve. One scolex with beginning of strobile. [Pl. XXI, fig. 242.]

Squalus acanthias, *Horned Dog-fish, Spiny Dog-fish.*

FOOD.

A specimen examined by me July 26, 1900, had been confined in the pool two or three weeks. The alimentary tract was almost entirely empty, except a few bits of eelgrass and the test of a young sea-urchin 1.5 mm. in diameter. Vinal N. Edwards says he has examined the stomachs of this dog-fish and found them filled with ctenophores. No entozoa were found. Mr. C. F. Silvester reports that he finds fish of various kinds in the stomachs of spiny dog-fish from Provincetown, Mass.

7. p. 274.

Raja erinacea, *Summer Skate.*

FOOD.

Usually crustacea and annelids, but bivalve mollusks, squid, and fish also frequently found in the stomach. In the summer of 1899 thirty-two skates were examined and the following food material noted: Crabs (hermit, *Cancer*, *Callinectes*, *Panopeus*, and others), shrimps, amphipods, annelids, squid, bivalve mollusks, small fish.

NEMATODES.

1. *Ascaris rotundata* Rudolphi. Stomach and intestine. [Pl. III, figs. 14–18.]

Nematodes found on several occasions are referred to this species. Length of males, 12 to 18 mm.; females, 25 to 40 mm. There are three postanal, one large and two small, and eight or nine preanal papillæ on each side in the male. Mouth trilobed, the lips projecting into blunt papillæ, and

surrounded by a circle of minute teeth, which traverses the middle of inner surfaces of lobes, there being twelve or more of these dentigerous ridges on each lip.

2. *Nematodes*, immature.
Found on a few occasions in the alimentary tract, evidently introduced with food.

CESTODES.

3. *Echeneibothrium variabile* Beneden. Spiral valve. **1**, pp. 460–462, pl. I, figs. 9–13. **2**, pp. 766–767. **5**, p. 440. **7**, p. 274. In 1899, 4 found, 32 skates examined. July 9, 1900, 24 skates examined, no *E. variabile*.
4. *Rhynchobothrium imparispine* Linton. Spiral valve. **2**, pp. 840–843, pl. XII, figs. 6–9. **5**, p. 450. July 27, 1899; blastocyst, with larva, in stomach. Aug. 4, 1899; larva, in stomach. Food in two latter cases consisted of annelids, bivalve mollusks, *Cancer irroratus*, and shrimp. July 9, 1900; one specimen obtained from a lot of 24 skates; length in alcohol, 56 mm.
5. *Rhynchobothrium tumidulum* Linton. Spiral valve. Aug. 12, 1899; 1. First record of this species in the skate. See under *Mustelus canis*, No. 7.
6. *Tetrarhynchus*, cysts. Intestinal wall. **4**, p. 809. July 19, 1899; two small cysts, with degenerate connective tissue in stomach wall. Aug. 17, 1899; several cysts in intestinal wall, filled with degenerate tissue which effervesces briskly with dilute hydrochloric acid.

Raja ocellata, *Big Skate, Winter Skate.*

FOOD.

Squid and annelids.

NEMATODES.

1. *Nematode*, immature. **7**, p. 274.

CESTODES.

2. *Rhynchobothrium imparispine* Linton. **7**, p. 274. See under *Raja erinacea*, No. 4.
3. *Cyst.* Stomach wall. **7**, p. 274.

Raja eglanteria, *Brier Ray.*

NEMATODES.

1. *Ascaris rotundata* Rudolphi. One male specimen in U. S. N. M. collection; length, 12 mm. Four small postanal and eight larger preanal papillæ were counted on each side. See under *Raja erinacea*, No. 1.

Raja lævis, *Barndoor Skate.*

FOOD.

Two specimens taken by the schooner *Grampus* off Gay Head July 30, 1900, in 65 to 70 fathoms, and examined by Mr. C. W. Stone, were found to have lobsters in their stomachs.

CESTODES.

1. *Rhinebothrium minimum* Beneden. Spiral valve. **5**, pp. 441–442, pl. XXXIII, fig. 5.
2. *Acanthobothrium coronatum* Rudolphi. [Pl. XXVI, fig. 293.] Spiral valve. July 30, 1900, 16; the longest measured 90 mm. in formalin; several had their heads firmly embedded in intestinal wall, in which places some of the surrounding tissue seems to have undergone some degeneration. Dimensions of a specimen in glycerine, slightly compressed, in millimeters: Length, 58; length of head, 1; breadth of head, 1; breadth of neck, 0.4; length of hooks, 0.17; length of first distinct segments, 0.03; breadth, 0.45; length of last segment 1, breadth 0.57; length of a free segment 2.7, breadth 0.9.
3. *Rhynchobothrium imparispine* Linton. Spiral valve. July 30, 1900; 1. First record of this species in this host. See under *Raja erinacea*, No. 4.
4. *Tetrarhynchus robustus* Linton. July 30, 1900; 3 scolices, which look as if they had but recently emerged from their cysts. See under *Dasyatis centrura*, No. 18.

TREMATODES.

5. *Distomum veliporum* Creplin. Stomach. **6**, pp. 521–522.
6. *Distomum* sp. [Pl. XXXI, figs. 348, 349.]

A single specimen collected July 30, 1900, was at first thought to be near *D. fucundum*. The general habit of the body is much as in that species. The opening of the acetabulum, however, instead of being transverse, is longitudinal. It suggests also Beneden's *D. cestoides*, but the testes appear to lie transversely near the posterior end instead of on the median line. As far as can be made out from an examination of the specimen in glycerine, it has the following characters: Body smooth, thickish, depressed, of nearly the same breadth throughout, rounded at each extremity; aperture of mouth nearly circular, a little wider than long; acetabulum much larger than oral sucker, aperture elongated; pharynx pyriform, with the larger end in front and overlapped by the oral sucker; œsophagus at least as long as pharynx; intestinal rami not clearly made out, but apparently simple and reaching to the posterior end; cirrus passes dorsal to the acetabulum to the right of the œsophagus as far as the pharynx, whence it curves back and opens at the anterior border of the acetabulum. Testes two, side by side near the posterior end; ovary smaller, apparently two-lobed, in front of testes and toward the left; uterus in front of testes in middle of body; ova of different sizes. Vitellaria two narrow clusters of small dark-brown bodies lateral to the testes, the one on the right extending less than halfway to the acetabulum, the other a little more than halfway. Dimensions in millimeters: Length, 7.5; breadth, 2; oral sucker, length 0.97, breadth 0.94, aperture 0.25 long and 0.28 wide; acetabulum, length 1.38, breadth 1.5, aperture 0.48 long and 0.33 wide; pharynx, length 0.44, greatest breadth 0.33; larger ova 0.086 and 0.045, smaller 0.062 and 0.035, in the two principal diameters.

Tetronarce occidentalis, *Torpedo*.

FOOD.

The alimentary canal was nearly empty in all the torpedoes I have examined, a few remains of fish being about the only identifiable contents. The stomach and intestine in all cases, including one specimen examined in 1889 and two in 1900, contained an extremely viscid and tenacious mucus. The extraordinary thickness of the walls of the alimentary tract is apparently associated with equally extraordinary digestive power.

CESTODES.

1. *Calyptrobothrium occidentale* Linton. Spiral valve. **7**, pp. 274–275 and 298–299, pl. XLI, figs. 92–97. July 29, 1899; 3 strobiles; scolices not found. July 16, 1900; 5, small, 20 to 27 mm. in length, only 1 with scolex. The changes wrought in the appearance of the scolex of this species by different states of contraction are very diverse.
2. *Rhynchobothrium imparispine* Linton. Larvæ in cysts in intestinal wall. **7**, p. 275.
3. *Tetrarhynchus bisulcatus* Linton. **5**, pp. 810–811, pl. LXVI, figs. 13, 14.

Dasyatis centrura (*Trygon centrura*), *Sting Ray*.

FOOD.

The stomachs of the sting rays which I have examined have been, as a rule, empty. Fragments of crustacea and annelids, however, have been found in most cases somewhere in the alimentary tract; small fish recorded in one instance.

NEMATODES.

1. *Ascaris* (?). Immature. Spiral valve.

A single specimen collected August 1, 1887. It is immature, has been introduced with food, and the sting ray may not be its proper host. Body smooth, of nearly uniform diameter, with fine longitudinal striæ. Head with four blunt, rather obscure papillæ. Tail slenderly mucronate. Some dimensions in millimeters: Length, 18; diameter of head, 0.08; length of œsophagus 1.12, diameter 2 mm. from head at middle and 2 mm. from posterior end 0.22; diameter at anal aperture, 0.12; distance of anal aperture from posterior end, 0.16. The body enlarges slightly at base of œsophagus.

CESTODES.

All except encysted forms from spiral valve.

2. *Anthobothrium pulvinatum* Linton. [*Rhodobothrium pulvinatum*, Am. Journ. Sci. and Arts, March, 1889.] **2**, pp. 759–765, pl. IV, figs. 4–9; pl. V, figs. 1–2. **5**, pp. 439–440, pl. XXX, fig. 1. **7**, p. 275. Aug. 24, 1899; 1; large, with large number of free proglottides.

3. *Paratænia medusia* Linton. [Pl. XXVI, figs. 290–291.] **2**, pp. 862–866, pl. XV, figs. 5–9. **5**, p. 440. **7**, p. 275. July 19, 1899; very numerous.

Much smaller than specimens found in previous years. Dimensions in millimeters: Length of head and chain of 10 segments, 0.5; length of last segment, 0.2; length of head, 0.08; diameter of head, 0.08. In some the segments were rounded and the chain moniliform; in others the segments were squarish or rectilinear in outline and crowded together; but in all cases they separate easily from each other.

4. *Spongiobothrium variabile* Linton. **1**, pp. 462–464, pl. II, figs. 13–16. **2**, pp. 778–780. **5**, p. 442. **7**, p. 275. July 19, 1899; 13 from upper part of spiral valve.
5. *Rhinebothrium flexile* Linton. **2**, pp. 768–771, pl. V, figs. 3–5. **7**, p. 275.
6. *Rhinebothrium cancellatum* Linton. **7**, p. 275. See under *Rhinoptera bonasus*, No. 1.
7. *Phyllobothrium foliatum* Linton. **2**, pp. 787–794, pl. VI, figs. 5–10. **5**, p. 443. **7**, p. 275. Aug. 24, 1899; 9, and a large number of free proglottides.
8. *Anthocephalum gracile* Linton. **2**, pp. 794–796, pl. VII, figs. 1–2. **7**, p. 275.
9. *Lecanicephalum peltatum* Linton. **2**, pp. 802–805, pl. IX, figs. 2–4. **7**, p. 275. July 19, 1899; 4.
10. *Orygmatobothrium crenulatum* Linton. **5**, pp. 444–445, pl. XXXIII, figs. 9–12, pl. XXXIV, fig. 1.
11. *Acanthobothrium paulum* Linton. **2**, pp. 816–819, pl. VIII, figs. 1–7. **7**, p. 275. July 19, 1899; 25 in lower part of spiral valve.
12. *Onchobothrium uncinatum* Diesing. **5**, p. 446, pl. XXXIV, figs. 2–5.
13. *Rhynchobothrium hispidum* Linton. **2**, pp. 833–835, pl. XI, figs. 12–17. **7**, p. 275. July 19, 1899; very numerous, with many ripe proglottides. The latter become dark colored after lying in water for a few hours. The heads adhere very closely to the mucous membrane and may be overlooked by the inexperienced collector.
14. *Rhynchobothrium longispine* Linton. **2**, pp. 835–837, pl. XI, figs. 18–20.
15. *Rhynchobothrium tenuispine* Linton. **2**, pp. 837–838, pl. XII, figs. 1–2. **5**, pp. 448–449, pl. XXXIV, fig. 8.
16. *Rhynchobothrium wageneri* Linton. **2**, pp. 843–845, pl. XII, figs. 10–12.
17. *Tetrarhynchus tenuis* Linton. **2**, pp. 853–855, pl. XIV, figs. 5, 6. **5**, p. 452.
18. *Tetrarhynchus robustus* Linton. **2**, pp. 855–857, pl. XIV, figs. 7–9.
19. *Tetrarhynchus*. Cysts in the stomach wall. **1**, pp. 808–809. July 19, 1899; cysts under serous coat of stomach and pylorus; also a large one on the spleen. These were all filled with degenerate tissue, yellowish white and of a cheesy consistency.
20. *Symbothrium filicolle* Linton. [*Syndesmobothrium filicolle*.] **2**, pp. 861–862, pl. XV, figs. 2–4. **1**, p. 819, pl. LXVIII, fig. 10. **7**, p. 275.

TREMATODES.

21. *Epibdella bumpusii* Linton. External. **7**, pp. 275, 286–287, pl. XXXIV, figs. 11–15.
Mr. Vinal N. Edwards says that this ectoparasite is usually found on the sharp-nosed ray.

22. *Branchiobdella raveneli* Diesing. External. Found on several occasions. Report of U. S. Fish Commission for 1871–72, p. 624, pl. XVIII, fig. 89.

PROTOZOA.

23. In the intestinal contents of a sting ray examined July 19, 1899, enormous numbers of small bodies were seen, long-elliptical in outline and measuring 0.014 mm. and 0.006 mm. in the two principal diameters [pl. I, fig. 5].

Myliobatis freminvillei, *Sharp-headed Ray.*

FOOD.

The stomachs of the few specimens which I have examined have been empty, with the exception of one, in which were pieces of a large univalve mollusk, probably *Sycotypus*.

CESTODES.

All cestodes from spiral valve.

1. *Rhinebothrium longicolle* Linton. **2**, pp. 775–778, pl. VI, figs. 1–4. **5**, pp. 441, pl. XXXIII, figs. 2–4. **7**, p. 275.

2. *Echeneibothrium* sp. [Pl. XXVI, figs. 285–288.] From a specimen taken by the schooner *Grampus* July 29, 1899, off Gay Head in 65 fathoms. Specimens collected by Mr. J. A. Stewartson.

Specimens small, not exceeding 10 mm. Length of head of one which measured 7.5 mm. was 0.38 and the breadth 0.43 mm. The bothria were contracted by the formalin, in which they had been placed, and their real structure is difficult to make out. Upon superficial view they appear to be divided into five loculi, by transverse costæ. A single bothrium was separated and placed in acetic acid, and showed a structure much like that found in *R. minimum* (**5**, pp. 441–442, pl. XXXIII, fig. 5); that is, nine or ten loculi arranged around a central space. In one specimen the bothria were distinctly in pairs, which corresponded to the flat surface of the body. In their contracted condition the bothria are attached by their posterior ends and project forward; their borders are finely crenulate; slightly tumid immediately behind the head, but evidently capable of elongation, and may appear very different under varying conditions; transversely striate, striæ merging quickly into divisions between segments. Strobiles clavate, posterior edges of segments slightly projecting. Mature segments not seen. A cylindrical myzorhynchus with a terminal aperture was seen in one specimen, projecting a little in front of the anterior edges of the bothria.

3. *Acanthobothrium paulum* Linton. July 29, 1899; 1. See under *Dasyatis centrura*, No. 11.

4. *Rhynchobothrium agile* Linton. **5**, p. 451, pl. XXXIV, figs. 12–15. **7**, p. 275.

5. *Rhynchobothrium imparispine* Linton. July 29, 1899; numerous. The specimens in this lot are variable, but the character of the hooks is that of this species. The size is smaller than those upon which the species was founded. See under *Raja erinacea*, No. 4.

6. *Tetrarhynchus robustus* Linton. **7**, p. 276. See under *Dasyatis centrura*, No. 18.

7. *Rhynchobothrium*. Cysts. July 29, 1899; from stomach wall between mucosa and submucosa, about 2 mm. in length. The hooks seen through sheath suggest *R. longispine* (**2**, pp. 835–837, pl. XI, figs. 18–20).

TREMATODES.

8. *Distomum macrocotyle* Diesing. July 29, 1899; 3 and fragment from stomach. The two largest specimens measure 16.5 mm. in length and 2 mm. and 3.4 mm., respectively, in breadth.

Chimæra affinis.

NEMATODES.

1. *Ascaris rotundata* Rudolphi.

One male, length 22 mm.; fragment of female, length 34 mm.; maximum diameter about middle, 1.5 mm.; collected by S. E. Meek, Fulton Market, New York, October, 1886.

Rhinoptera bonasus (*Rhinoptera quadriloba*), Cow-nosed Ray.

FOOD.

The following material has been noted: Adductor muscles of clam, opercula of some gasteropod mollusk (*Lunatia?*) packed together like a pile of saucers, a small lobster, fragments of crabs, and other crustacea.

CESTODES.

All from spiral valve.

1. *Rhinebothrium cancellatum* Linton. **2**, pp. 771–775, pl. V, figs. 3–5.

2. *Echeneibothrium* sp. [Pl. XXVI, figs. 283, 284.] Near *E. affine* Olsson. 1899, Aug.; 3 small specimens; from ray taken by the steamer *Fish Hawk*.

These worms do not exceed 10 mm. in length. They differ from No. 2 under *Myliobatis freminvillei* in the more pedicellate character of bothria and less definite loculi on same. The myzorhynchus, instead of being cylindrical, is conical when extended; when retracted the head looks like *E. variabile*, only much smaller. Dimensions of a specimen in millimeters: Length, 7.5; length of bothrium, 0.30; breadth of head, 0.50; breadth of bothrium, 0.17; diameter of myzorhynchus, at base 0.07, at apex 0.04; diameter of body just behind head, 0.09; last segment (irregular length), 0.73; greatest breadth, anterior, 0.23; least breadth, posterior, 0.12; penultimate segment, length 0.38, breadth 0.29.

3. *Tylocephalum pingue* Linton. **2**, pp. 806–809, pl. IX, figs. 5–9.

4. *Rhynchobothrium brevispine* Linton. **5**, pp. 450–451, pl. XXXIV, figs. 9–11.

5. *Rhynchobothrium agile* Linton. **5**, p. 451, pl. XXXIV, figs. 12–15.

6. *Tetrarhynchus robustus* Linton. **5**, p. 452. See also under *Dasyatis centrura*, No. 18.

Acipenser sturio, *Sturgeon.*

NEMATODES.

1. *Dacnitis sphærocephala* Dujardin. [Pl. XVI, figs. 200–202.] Aug. 5, 1884; 1, a female with embryos from intestine. Dimensions in millimeters: Length, 24; diameter of head, 0.38; length of œsophagus, 2.1; greatest diameter, 5 mm. from head, 0.64; diameter 4 mm. from posterior end, 0.5; diameter at anal aperture, 0.24; distance of anal aperture from posterior end, 0.5.

CESTODES.

2. Cysts on spleen, coat of stomach, and intestine.

TREMATODES.

3. *Nitzschia elongata* Nitzsch. [*Nitzschia elegans* Baer.] Gills. **6**, p. 508.

Acipenser brevirostris, *Short-nosed Sturgeon.*

ACANTHOCEPHALA.

1. *Echinorhynchus attenuatus* Linton. **3**, p. 529, pl. LV, figs. 23–30.

Acipenser rubicundus, *Lake Sturgeon.*

The following notes on entozoa from the lake sturgeon are given in this connection.

ACANTHOCEPHALA.

1. *Echinorhynchus globulosus* Rudolphi.

Two specimens in the U. S. National Museum collection, collected by J. W. Milner, appear to belong to this species.

TREMATODES.

2. *Distomum auriculatum* Wedl. **6**, pp. 521–522, pl. LXV, figs. 8–10, pl. LXVI, figs. 1–5.

Pratt proposes the name *Bunodera lintoni* for this species.

Anguilla chrysypa (*Anguilla vulgaris*), *Eel.*

FOOD.

Shrimp, crabs, annelids, mollusks, small fish.

ACANTHOCEPHALA.

1. *Echinorhynchus globulosus* Rudolphi.

Three specimens in the U. S. National Museum collection appear to belong to this species. Male, 5.5 mm.; female, 6 mm. Aug. 7 and 28, 1899; numerous. Male, 7 mm.; female, 10 mm. This species resembles *E. æus*, but differs from that species in the greater relative length of the lemnisci, the erect and usually distinctly tapering proboscis, and the tubular instead of globular prostate gland.

2. *Echinorhynchus agilis* Rudolphi.

Two specimens from the U. S. National Museum collection. **1**, pp. 490–492, pl. V, figs. 1–6.

NEMATODES.

3. *Immature nematodes* (*Ascaris* sp.). [Pl. XI, figs. 125, 126.] **7**, p. 276. Aug. 5, 1899; 2 immature, encapsuled on viscera.

Two specimens in the U. S. National Museum collection; also immature and encapsuled. Length, 22 mm.; diameter, 1 mm. Somewhat attenuate anteriorly, tail pointed and mucronate at tip (*Agamonema capsularia*).

CESTODES.

4. *Tænia dilatata* Linton. **1**, pp. 488–489, pl. V, figs. 14–16. **5**, p. 425.

Specimens of this genus also taken in 1899; three on August 2. Dimensions in millimeters: Length, 8; diameter of head, 0.28; diameter of sucker, 0.08. Segments not mature. One specimen August 28; length, 14 mm. [Pl. XXV, figs. 272, 273.]

5. *Rhynchobothrium heterospine* Linton. **4**, p. 799, pl. LXIV, figs. 3–8. See under *Mustelus canis*, No. 8.
6. *Rhynchobothrium imparispine* Linton. **7**, p. 276. See under *Raja erinacea*, No. 4.
7. *Rhynchobothrium bulbifer* Linton. Aug. 12, 1899; numerous cysts on viscera.
8. *Rhynchobothrium*. Cysts. **4**, p. 794, pl. LXII, fig. 16, and pl. LXIII, fig. 1. **7**, p. 276.
9. *Larval cestodes* (*Scolex polymorphus* Dujardin). **7**, p. 276. Seen also Aug. 12, 1899.

TREMATODES.

10. *Distomum grandiporum* Rudolphi. **6**, pp. 520–521, pl. XLIV, fig. 9. Aug. 28, 1899; 1. Length, 10 mm. See under *Pseudopleuronectes americanus*, No. 6.
11. *Distomum vitellosum* Linton. Aug. 12, 1899; 1. See under *Merluccius bilinearis*, No. 9.
12. *Distomum* sp. [See pl. XXV, figs. 228, 229.] Aug. 10, 1900.

Resembles species figured in **7**, pl. XXXIV, fig. 72. Dimensions in millimeters: Length, 1.96; breadth, 0.58; diameter of oral sucker 0.19, of acetabulum 0.19; length of pyriform pharynx, 0.17, greatest breadth 0.1; ovum 0.076 and 0.038 in the two principal diameters. Cirrus and uterus pass to right of acetabulum. Specimen not in good condition; probably introduced with food.

Leptocephalus conger, *Conger Eel.*

FOOD.

Fish. Aug. 2, 1899; 1; fish in stomach. July 30, 1900; 1; fish in the alimentary canal. July 31, 1900; 1; a herring and 3 butter-fish in stomach; crystalline lenses and other fragments of fish in intestine. August 25, 1900; 1; young eel and fish in stomach; fin rays and an annelid (*Nereis*) in intestine.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. July 31, 1900; 7; stout-bodied, yellowish; flaccid when first removed from intestine, became plump after lying in sea water. Aug. 25, 1900; 1; length, 20 mm. For account of species, see **1**, p. 492, and **3**, p. 525.

NEMATODES.

2. *Dacnitis hians* Dujardin. [Pl. XVI, figs. 203, 204.] July 30, 1900; 1; from eel taken by schooner *Grampus* off Gay Head in 65 to 70 fathoms; collected by C. W. Stone.

This specimen agrees with Dujardin's description, but is smaller in some of its dimensions. It probably came from the intestine, since it is an adult female with ova in the uterus undergoing segmentation. Dimensions in millimeters: Length, 20; diameter of head, 0.26; of body at middle, 0.41; length of œsophagus, 1.23; distance of anal aperture from posterior end, 0.65; ova, 0.08 and 0.05 in the two principal diameters; of nearly uniform diameter throughout. A few found August 25, 1900.

3. *Immature nematodes.* Encapsuled on intestine. Several. Same host as No. 2.

CESTODES.

4. *Rhynchobothrium imparispine* Linton. Several larvæ in pyriform blastocysts and cysts on serous coat of intestine. Same host as No. 2. For description of species, see **2**, p. 840.
5. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. Aug. 2, 1899; July 31, 1900. For account of similar forms see **5**, p. 789.

TREMATODES.

6. *Distomum simplex* Rudolphi. Aug. 2, 1899; 2. For description of species, see **6**, 525.

Dimensions of specimens in water, given in millimeters: Length, 4; diameter, anterior 0.21, at middle 0.61, posterior 0.21; length of oral sucker 0.21, depth 0.19; length of acetabulum 0.37, depth 0.36; ovum, 0.073 and 0.045 in the two principal diameters; length of second specimen, 2.07. See under *Microgadus*, No. 6.

7. *Distomum vitellosum* Linton. Intestine. **7**, p. 290, pl. XXXVII, figs. 38, 39.

Six small specimens which agree best with this species; collected August 25, 1900. The worms were turgid and motionless, although they were examined as soon as collected, at which time they had been put in salt water. Some specimens of this species, collected at the same time as these, but

from the blue-fish, remained active for a long time. It is likely that these had been introduced along with food into the alimentary tract of the conger and were there in an uncongenial place.

Tarpon atlanticus, *Tarpon.*

NEMATODES.

1. *Ichthyonema globiceps* Rudolphi. [Pl. XVIII, figs. 216, 217.] U. S. National Museum collection.

A tangled mass; original number of constituent individuals not made out. The longest piece, when disentangled, measured 385 mm.; aggregate length of pieces, 3 meters; diameter about 1 mm. Uterus filled with ova. In the earlier folds the ova were dark amber color, spherical, 0.014 mm. in diameter; in later folds the ova were light amber color, elliptical, 0.024 mm. to 0.026 mm. in the longer and 0.02 mm. in the shorter diameter.

CESTODES.

2. *Dibothrium laciniatum* Linton. **5**, pp. 435–436, pl. XXX, figs. 7–16, and pl. XXXI, figs. 1–7.

Clupea harengus, *Herring.*

FOOD.

Only young fish have been examined. The young herring is an indiscriminate surface feeder, as the following food notes will show:

July 17, 1899; 3. Stomachs with young squid and shrimp; one filled with nereis-like annelids, about 30 mm. in length.

July 26, 1899; 23. Copepods and megalops of crab in alimentary canal.

July 27, 1899; 4. Alimentary tract with teeth and setæ of annelids.

July 31, 1899; 100. Small; about 30 mm. in length. Copepods and annelids in stomachs.

August 8, 1899; 7. Small crustacea and diatoms.

July 9, 1900; 12. Eighty millimeters in length. Alimentary canals filled with copepods.

NEMATODES.

1. *Ascaris*, immature.

U. S. National Museum collection. These agree with descriptions of *Agamonema capsularia*, but are evidently young ascarids. Length, 25 mm., tapering more anteriorly than posteriorly, with posterior end minutely mucronate. **7**, p. 277. July 27, 1899; a few encysted on viscera. August 12, 1899; 2 small nematodes from viscera.

CESTODES.

2. *Rhynchobothrium imparispine* Linton. July 17, 1899. Encysted in stomach wall. For description of species, see **2**, p. 840.
3. *Rhynchobothrium.* Larvæ encysted on viscera. **7**, p. 277. July 26 and 27, 1899; a few. One of these is sketched in fig. 229 of pl. XX.
4. *Larval cestode* (*Scolex polymorphus* Dujardin). Small. Free in intestines. July 17, 1899; numerous. July 31, 1899; numerous. For account of similar forms, see **5**, pp. 789–792.

TREMATODES.

5. *Distomum appendiculatum* Rudolphi (?). Intestines. July 26, 1899; 9. July 27, 1899; a few. July 31, 1899; 20. Aug. 8, 1899; several. Aug. 12, 1899; 12. July 9, 1900; 2. For an account of this species, see **7**, p. 289, pl. XXXVI, figs. 25, 26.
6. *Distomum vitellosum* Linton. See **7**, p. 290, pl. XXXVII, figs. 38, 39. July 31, 1899; 1.

I record under this name a small cylindrical distome seen in small number but in various hosts in the summers of 1899 and 1900. The measurements on this specimen from the herring agree with those of *D. vitellosum*. There is an evident œsophagus, which was not made out in the specimens taken in the summer of 1898.

7. *Distomum bothryophoron* Olsson (?). July 26, 1899; 3. July 31, 1899; few.

This species found in the herring and alewife in the summer of 1899. The body is short, fusiform, diameter greatest at acetabulum, about four-tenths of length of body. A few dimensions of one from the herring, in glycerine, given in millimeters are: Length, 0.87; length of oral sucker, 0.12, depth 0.13; length of pharynx, 0.065, depth 0.08; length of acetabulum 0.32, depth 0.15; ova, 0.02 and 0.013 in the two principal diameters. The specimen was lying on its side and was considerably flattened under the compressor. Further description of this species under *Pomolobus pseudoharengus.*

PROTOZOA.

8. *Sporozoa.* [Pl. I, figs. 1–3.] July 26 and 27, 1899.

About half the fish examined on these dates were found by Mr. J. A. Stewartson to be infested with a parasite among the muscles of the back and side. These were not examined closely at the time of collection, but pieces of muscle with cysts were preserved and subsequently sectioned. They were then seen to be sporocysts. On July 9, 1900, a young herring 8 cm. in length was examined. The flesh along the back and sides, from head to tail, was filled with small white tumors. While these were of various sizes, none were large. Two of the larger cysts measured 1.74 by 1.16 and 1.16 by 0.58 mm. in the two principal diameters. The sporozoa when placed so that the four polar vesicles are uppermost are squarish in outline with rounded corners, and measure about 0.007 mm. in diameter (fig. 3). The polar vesicles are of a faint greenish tint, the remainder of the spore colorless.

Sections of the infested muscular tissue show that the spores lie in clusters, which are in some cases enveloped in a definite connective cyst and in others not. The spores were also seen in great numbers lying along the intermuscular connective tissue fascia. One instance was noted in a series of cross sections where a cluster of spores had established themselves in the midst of a muscle fiber (fig. 2). I am informed by Mr. E. E. Tyzzer, who is studying this and other myxosporidia, that he has not found the herring infested with this form, but that about half the young alewives examined are infested; further, that the sporocysts are not common in the larger fish, and, moreover, the spores are not in such good condition. The vitality of the infested fish must necessarily be much impaired by the presence of sporozoa in such great abundance in the tissues, whereby they fall victims to their enemies in larger proportional numbers than do their healthy associates. It is for this reason, doubtless, that there is a less proportional number of infested individuals among the larger fish than among the smaller.

Clupanodon pseudohispanicus, *Spanish Sardine.*

FOOD.

Two small specimens were examined August 15, 1899. The alimentary tract contained numerous copepods.

TREMATODES.

1. *Distomum appendiculatum* Rudolphi. Few. Dimensions of one in glycerine, in millimeters: Length, 0.86; diameter of oral sucker 0.06, of ventral sucker 0.12.

Pomolobus mediocris, *Hickory Shad.*

FOOD.

July 28, 1899; 1; stomach empty. August 13, 1900; 1; fish scale and pen of squid in pylorus. August 16, 1900; 1; fragments of crustacea and a small crab in alimentary tract.

NEMATODES.

1. *Ascaris* sp. [Pl. v, figs. 41–45.]

Twenty-eight large and 3 small specimens from stomach, July 28, 1899. Length of a male 30 mm., of a female 44 mm.; length of smaller specimens, 10 mm. Four postanal papillæ and 28 preanal on each side in male; of the preanal the 10 posterior are the smaller, the remaining 18 larger and in sets of 2; both kinds are in a single row. These specimens have many points of resemblance to *A. clavata.*

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine, July 28, 1899, and Aug. 13, 1900. For account of similar forms, see **4**, pp. 789–792.

TREMATODES.

3. *Distomum appendiculatum* Rudolphi. Stomach and pylorus. See **7**, p. 289, pl. XXXVI, figs. 25, 26. July 28, 1899; 33. Aug. 13, 1900; numerous. Aug. 16, 1900; numerous.

Dimensions in millimeters, life: Length, 2; diameter of oral sucker, 0.09; diameter of acetabulum, 0.18; ova, 0.024 and 0.012 in the two principal diameters.

Many spherical bodies with concentric structure were noted in the contents of the excretory vessels. The largest of these measured 0.016 mm. in diameter (**7**, p. 288).

While watching a living specimen a curious phenomenon was observed in the vicinity of the shell gland. A fine hair-like body which lay in several coils appeared to be turning rather rapidly around a central space. A somewhat similar appearance was present in two smaller spaces nearby. The specimen, while still living, had been partly stiffened by holding the compressor over the flame of an alcohol lamp for a few seconds. This phenomenon evidently has something to do with the formation of the eggshell, but just what I could not make out.

Pomolobus pseudoharengus, *Alewife.*

FOOD.

Only young have been examined. Thirty-six were examined in July and August, 1899, on five different occasions. In all of them the alimentary canal contained copepods, sometimes in enormous numbers. In the summer of 1900 (July 9 and August 10) fourteen specimens were examined, and in addition to copepods young squid and large numbers of small shrimp were found. These specimens were taken at Wareham and were larger than the fish examined the year before. About the same entozoa are found in the young alewife as in the young herring, with which they are associated.

NEMATODES.

1. *Nematodes*, immature. A few found in one lot in 1899 (Aug. 15).

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. Aug. 3, 1899. For account of similar forms, see **4**, 789–792.

TREMATODES.

Obtained by washing out the alimentary canal and decanting the material.

3. *Distomum appendiculatum* Rudolphi. Found on all occasions in 1899, usually numerous. Aug. 10, 1900; very numerous. See **7**, p. 289, pl. XXXVI, figs. 25, 26. Measurements of living specimens in one lot, 1.28 mm. to 2.56 mm.
4. *Distomum vitellosum* Linton. See **7**, p. 290, pl. XXXVII, figs. 38, 39; also under *Clupea harengus*, No. 6.
5. *Distomum bothrygophoron* Olsson (?). [Pl. XXXII, figs. 355, 356.] See under *Clupea harengus*, No. 7. Aug. 2, 3, and 19, 1899; very few.

Body smooth, short, fusiform; neck conical; tail tapers to a point. Oral sucker nearly circular in ventral view, aperture broadly triangular; pharynx subglobular, close to oral sucker; œsophagus, none; rami of intestines simple, extending nearly to posterior end. Acetabulum in middle of body, prominent, about twice the diameter of the oral sucker, aperture transverse. Testes two, rather small, oval-elliptical, immediately behind the acetabulum. Ovary behind testes. Exact position not clearly determined. Vitellaria a single six or seven lobed mass, lying laterally toward the posterior end. Ova small, elliptical, very numerous, filling all of body back of acetabulum. Reproductive aperture in front of acetabulum, on median line. Dimensions in millimeters of specimen in glycerine: Length, 0.8; diameter of body, anterior 0.1, middle 0.3, posterior 0.03; diameter of oral sucker 0.1, of acetabulum 0.3; testes, 0.07 and 0.05 in two principal diameters; pharynx, length 0.05, depth 0.07; ova, 0.017 and 0.010 in the two principal diameters. These measurements were made from ventral view, except the pharynx, which was measured in lateral view.

6. *Monostomum* sp. [Pl. XXXIV, figs. 377–379.] Aug. 19, 1899; 4. Very small, oval or elliptical.

Dimensions in millimeters: Length, 0.6; diameter, 0.34; diameter of genital acetabulum, 0.07; diameter of oral sucker, 0.07; ova, 0.02 and 0.017 in the two principal diameters. Vitellaria in two masses lying one on either side of genital acetabulum. Uterus very voluminous; body behind acetabulum filled with ova.

PROTOZOA.

7. *Sporozoa*. Aug. 2, 1899; among the muscles of back and side. Of 22 fish 9 were infected.

Mr. E. E. Tyzzer says that about half of the young alewives examined by him in 1900 have these cysts in the flesh, but that they are less common in the larger fish. For fuller account, see under *Clupea harengus*, No. 8.

Alosa sapidissima, *Shad.*

NEMATODES.

1. *Ascaris* sp. [Pl. XII, figs. 138, 139.]

Immature; body slender, jaws prominent, apparently four teeth on upper lip; posterior end terminates in an acute conical point, roughened in most cases with minute spines; length, 12 mm. These specimens, from U. S. National Museum collection, were in a bad state of preservation when examined by me; date of collection and locality not given.

Brevoortia tyrannus, *Menhaden.*

FOOD.

See Peck's valuable contribution, The Sources of Marine Food, Bulletin U. S. Fish Commission for 1895, pages 351–368.

Thirty-two menhaden were examined in July and August, 1899, on eight different occasions. The character of food could be determined only by the use of the microscope, and was invariably vegetable material, especially diatoms. Large numbers of diatoms of many kinds were found in the intestines of some young specimens, 36 mm. in length, on July 28, 1899; also in an adult specimen on August 25, 1899.

CESTODES.

1. Cysts and blastocysts (*Symbothrium*) on viscera. **7**, p. 277.
2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. **7**, p. 277. July 17, 24, 27, and Aug. 3, 1899. For account of similar forms, see **4**, pp. 789–792.

TREMATODES.

3. *Distomum appendiculatum* Rudolphi. **7**, p. 289, pl. XXXVI, figs. 25, 26. Aug. 3, 1899; a few in intestine.
4. *Distomum vitellosum* Linton. See **7**, p. 290, pl. XXXVII, figs. 38, 39. One specimen found July 27, 1899. See under *Clupea harengus*, No. 6.

Stolephorus brownii, *Striped Anchovy.*

FOOD.

Fifty-two anchovies examined on seven occasions in 1899, from July 26 to Aug. 15. Intestines usually filled with copepods, but in a few cases immense numbers of univalve mollusks were found along with copepods.

NEMATODES.

1. *Immature nematode.* July 26, 1899; 1. Aug. 15, 1899; 1.

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. July 26, 1899, and Aug. 3, 1899; several. For account of similar forms, see **4**, pp. 789–792.
3. *Rhynchobothrium.* Cyst on viscera. Aug. 15, 1899; 1.

TREMATODES.

4. *Distomum appendiculatum* Rudolphi. July 31, 1899; 12. Aug. 3, 1899; few. **7**, p. 289, pl. XXXVI, figs. 25, 26.
5. *Distomum* sp. [Pl. XXIX, figs. 319, 320.] Aug. 12, 1899. Slender; minutely spinose.

The life dimensions in millimeters are: Length, 1.71; diameter, anterior 0.09, greatest diameter (one-third of length from head) 0.26, at middle 0.21, near posterior end 0.11; diameter of anterior sucker, 0.07; acetabulum, length 0.10, breadth 0.13; ova, 0.021 and 0.011 in the two principal diameters.

A mounted specimen is decidedly fusiform, with greatest diameter near the middle, at the acetabulum. The neck is conical; the anterior sucker somewhat elongated; the pharynx globose, remote from oral sucker, and followed by a slender œsophagus, which is longer than the pharynx. The median and posterior parts of the body are filled with ova. Dimensions of mounted specimen in millimeters: Length, 1.16; oral sucker, length 0.07, thickness 0.045; diameter of acetabulum 0.09; pharynx, length 0.034, thickness 0.041; diameter of body, anterior 0.065 at acetabulum 0.345, near

posterior end 0.069; ova, 0.021 and 0.010 in the two principal diameters. The entire body is covered with spines; those on the neck are sharp-pointed and triangular; on the body they are smaller and more slender; at the posterior end of the body they are minute. The cirrus is armed with comparatively coarse spines; cirrus pouch elongate. Vitellaria in mounted specimens appear to be two subglobular masses of coarsely polygonal granules, lying dorsal and a little posterior to the acetabulum; testes and ovary not distinctly shown in the specimens, but evidently all near the vitellaria.

Salmo salar, *Salmon.*

NEMATODES.

1. *Immature nematodes* (*Ascaris*). [Pl. XI, fig. 131.]

U. S. National Museum collection; Bucksport, Me., Mr. Atkins, collector. Two nematodes, evidently from capsules. Head with three lobes, body narrowing uniformly but slightly to each end; tail with a minute mucronate tip. Dimensions in millimeters: Length, 20; diameter, maximum 0.4, at anal aperture 0.14; distance of anal aperture from posterior end, 0.13; length of the other specimen, 24; diameter, 0.5. Fig. 90, sketched from a specimen from *Mustelus*, would also answer for these forms.

Salvelinus fontinalis, *Brook Trout.*

NEMATODES.

1. *Cucullanus elegans* Zeder.

U. S. National Museum collection; 5 collected by Dr. Robert F. Morris; locality not given. Female—length, 18 mm.; diameter, 0.45 mm. Male—length, 15 mm.; diameter, 0.25 mm. Ova, oblong-elliptical, 0.04 mm. and 0.02 mm. in the two principal diameters. A characteristic feature of these worms was the strongly marked longitudinal striations.

Osmerus mordax, *Smelt.*

NEMATODES.

1. *Ascaris* sp. Immature.

U. S. National Museum collection; 3 collected February 2, 1882; locality not given. Head with three rudimentary lobes; tail minutely mucronate. Dimensions of one of the largest in millimeters: Length, 41; diameter of head 0.3, middle 0.9, at anal aperture 0.23; distance of anal aperture from anterior end, 0.18. Fig. 90, from *Mustelus*, and fig. 131, from *Salmo*, will also answer for these forms.

CESTODES.

2. *Dibothrium ligula* Donnadieu. **5**, p. 438.

Fundulus heteroclitus, *Mummichog.*

FOOD.

The following fish from Waquoit Bay were examined in 1899: August 7; 26. Alimentary canals filled with green mud, consisting of a variety of vegetable débris, enormous numbers of diatoms, and foraminifers in considerable number. August 28; 22. Alimentary canals filled with vegetable material (eelgrass, etc.). A specimen from Katama Bay, August 28, 1900, had shrimp and other small crustaceans in the alimentary tract.

NEMATODES.

1. *Cucullanus* sp. [Pl. XVII, figs. 207, 208.] Aug. 28, 1899; a few small adults from intestine.

Measurements in millimeters: Length of male, 3.6 (alcoholic), female 4.8 (life), latter with ova segmenting in uterus near genital opening. Dimensions of female, life: Length, 4.8; diameter, anterior 0.11, middle 0.17, posterior at anal aperture 0.09; length of œsophagus, 0.56; diameter of œsophagus, anterior 0.11, middle 0.07, near posterior 0.12, narrowing to 0.07; distance from anterior end to nerve ring, 0.21; distance of anal aperture from posterior end, 0.19; ova, 0.075 and 0.048 in the two principal diameters. Reproductive aperture 2 mm. from posterior end.

2. *Immature nematodes* (*Ascaris*). Aug. 7, 1899; few.

CESTODES.

3. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. Aug. 28, 1899. For account of similar forms, see **4**, pp. 789–790.

TREMATODES.

4. *Distomum* sp. [Pl. XXXII, fig. 354.] Aug. 7, 1899; 12. Aug. 28, 1899; 4. Intestine.

Body very minutely spinose, white, translucent; acetabulum and oral sucker about same size; outline of body, long oval; neck, short, continuous with body; greatest breadth in region of testes, near posterior end; ecaudate; acetabulum sessile; rami of intestines simple, elongate; œsophagus as long as pharynx; testes, two, in median line behind uterus; seminal vesicle dorsal to ovary and posterior border of acetabulum; ovary between acetabulum and testes, on right side; pharynx, subglobular; genital aperture in front of acetabulum, on median line; vitelline glands lying at posterior end and along sides of body as far as acetabulum; ova, few, relatively large. Dimensions of specimen in formalin, given in millimeters: Length, 2.72; breadth, anterior 0.43, at acetabulum 0.89, middle 1.07, near posterior 0.36; diameter of oral sucker, 0.26; diameter of acetabulum, 0.29; diameter of ovary, 0.21; diameter of testes, 0.33 and 0.39; ova, 0.11 and 0.07 in the two principal diameters.

5. *Distomum tornatum* Rudolphi. Aug. 7, 1899; 2. Length, 8.5 mm.

Body unarmed, appendiculate; acetabulum larger than mouth, latter subterminal; caudal appendix elongate; cirrus minutely papillate. Dimensions in millimeters, from sections: Oral sucker, length 0.22, thickness 0.19; diameter of pharynx, 0.13; diameter of acetabulum, 0.43; ova, 0.14 and 0.007 in the two principal diameters. See **6**, pp. 513–514, pl. XLII, figs. 6–12.

6. *Diplostomum* sp. Globular cysts in liver. Aug. 30, 1899; specimens from Katama. Diameter of cysts in sections, 0.3 mm. [Pl. XXVII, fig. 307.]

Cyprinodon variegatus, *Short Minnow.*

I have no record of entozoa from this species. Wart-like tumors, caused by myxosporidia (*Myxobolus lintoni* Gurley), are occasionally found. A few have been seen by me in different seasons, but no formal record of them has been kept. **7**, p. 277. Linton, U. S. Fish Commission Bulletin for 1889, pp. 99–102, pl. XXXV. Gurley, U. S. F. C. Bulletin for 1891, p. 414. Gurley, U. S. F. C. Report for 1892, p. 238, pl. XXVII.

Tylosurus marinus, *Gar-fish.*

FOOD.

Fish and shrimps.

ACANTHOCEPHALA.

1. *Echinorhynchus agilis* Rudolphi. Aug. 11, 1899; 4. Intestine. For account of this species, see **2**, p. 490, and **3**, p. 534.

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Duj.). Small. Free in intestine. Aug. 11, 1899; few. **7**, p. 277.

TREMATODES.

3. *Gasterostomum* sp. [Pl. XXXIV, figs. 367–368.] **7**, pp. 277, 298, pl. XLI, fig. 91. Aug. 7, 1899; 11.

Thirty gars were examined, and this species found in considerable abundance. It was noted that the body was armed with short, rod-like, deciduous spines. Dimensions of living specimen in millimeters: Length, 1.43; diameter, anterior 0.28, median 0.65, posterior 0.25; ova, 0.017 and 0.012 in the two principal diameters.

Tylosurus acus (*Tylosurus caribbæus*), *Hound-fish.*

I have examined but one specimen of this gar—taken in Buzzards Bay, July 27, 1886. Several specimens of a goose barnacle (*Conchoderma virgata*) were attached to the top of head behind the eyes. Where the barnacles were rooted, the skin was off and the skull of the fish exposed.

ACANTHOCEPHALA.

1. *Echinorhynchus pristis* Rudolphi. **3**, pp. 530–531, pl. LVI, figs. 31–38. Var. *tenuicornis*. **3**, pp. 531–532, pl. LVI, figs. 39–41, and pl. LVII, figs. 42–53.

NEMATODES.

2. *Ascaris* sp. Immature. Intestine. An immature female, 17 mm. long. Lateral alæ for about 1 mm. back of head. Postanal region somewhat elongate, fine spines at posterior tip. Longitudinal muscle bundles strikingly prominent in acetic acid. Resembles No. 1 under *Microgadus tomcod*.

CESTODES.

3. *Dibothrium vestiforme* Linton. Intestine. **2**, pp. 722–728, pl. I, figs. 1–16.
4. *Rhynchobothrium speciosum* Linton. Larvæ encysted on viscera. **4**, pp. 801–805, pl. LXV, figs. 4, 5.

TREMATODES.

5. *Distomum nitens* Linton. **6**, pp. 534–535, pl. LI, figs. 5, 6, and pl. LII, fig. 1.

Gasterosteus bispinosus, *Two-spined Stickleback.*

TREMATODES.

One small distome was obtained from the intestine of this species July 24, 1900. A sketch was made of it while it was living. Unfortunately the specimen was lost and no further details of its anatomy than are shown in the sketch can be given. [Pl. XXXI, fig. 350.]

Apeltes quadracus, *Four-spined Stickleback.*

FOOD.

In the summer of 1900 I examined a small number of this and also of the nine-spined and two-spined stickleback. Most of them had been in the aquarium some time and the alimentary tracts were empty. Four taken at Wareham, Aug. 2, had their intestines filled with copepods.

Siphostoma fuscum, *Pipe-fish.*

FOOD.

Small crustaceans found in alimentary canal of pipe-fish taken at Wareham, August 2, 1900.

CESTODES.

1. *Rhynchobothrium heterospine* Linton.

A few cysts from a specimen taken in Katama Bay, August 28, 1900, resemble the forms figured in **4**, pl. LXIV, fig. 3. The larvæ when liberated were found to agree with this species in the character of hooks.

Menidia notata, *Silverside.*

FOOD.

August 28, 1899; 26; small crustacea and vegetable material. August 30, 1899; 23; annelids and shrimp. July 17, 1900; 50; setæ, spines, and jaws of annelids (*Nereis*), a few small (young) univalve mollusks, and small crustaceans. July 27, 1900; 6. Enormous numbers of small (young) univalve mollusks (0.3 mm. and less in length), diatoms, and sand; small copepod parasites on gills, very numerous.

NEMATODES.

1. *Immature nematodes.* Aug. 30, 1899; 2. July 17 and 27, 1900; 1 and fragment.

CESTODES.

2. *Rhynchobothrium.* Larvæ encysted on viscera, Aug. 30, 1899.

TREMATODES.

3. *Distomum tornatum* Rudolphi. [Pl. XXVIII, fig. 310.] Aug. 28, 1899; 30. Aug. 30, 1899; 10. July 17, 1900; few. See No. 4, under *Corgphana hippurus*.

Maximum size: Length, 11 mm.; diameter, 2 mm.

The following dimensions in millimeters are from sections, longitudinal vertical: Diameter oral sucker 0.22, of pharynx 0.16, of acetabulum (maximum) 0.5, of ovary (maximum) 0.46, of testes (maximum) 0.4; ova, 0.017 and 0.012 in the two principal diameters. These worms have a great variety of shape and color. In some the intestine is dark-brown and quite conspicuous; uterus, with eggs, convoluted in middle portion of body, amber yellow; vas deferens slender, thread-like, convoluted, opaque white. As these distomes lay amid the washings from the alimentary canal of the silverside, which contained the claws and bits of the shells of shrimps, annelids, and black and white strips of the peritoneum of their host, they were rather difficult to distinguish from their surroundings.

4. *Distomum* sp. Small, short, fusiform. [Pl. XXXII, figs. 357, 358.] Aug. 28, 1899; 6. Aug. 30, 1899; 2.

Resembling *D. bothryophoron* Olsson, but with more slender neck and distinct œsophagus.

5. *Distomum valde-inflatum* Stossich. In globular cysts, in the liver (July 17, 1900), and in fat masses in the body cavity (Aug. 30, 1899). These have spines around the mouth and smaller spines on neck. See **6,** pp. 527–528, pl. XLVII, figs. 10, 11, and pl. XLVIII, figs. 1, 2.

Mugil cephalus, *Jumping Mullet.*

FOOD.

August 28, 1899; 21, small, 90 mm. to 100 mm. long. July 28, 1900; 12, small. Fish in both cases from Waquoit Bay. Alimentary tracts filled with green mud, which contained large numbers of diatoms, green algæ, an occasional copepod, and much quartz sand, in minute angular grains. No entozoa were found.

Sphyræna borealis, *Barracuda.*

FOOD.

August 8 and 15, 1899; 8, small; remains of young fish in alimentary canal. July 27, 1900; 2, small; intestines filled with immense numbers of young univalves, 0.15 mm. to 0.3 mm. in diameter. Specimens from Katama. No entozoa found.

Scomber scombrus, *Mackerel.*

FOOD.

The only food notes I have are for young fish. August 2, 1899; remains of small fish. August 8 and 12, 1899; small crustaceans. July 9, 1900; small squid and copepods.

NEMATODES.

1. *Ascaris.* [Pl. VIII, figs. 73, 74, and pl. XIV, figs. 181, 182.]

Immature, probably *A. clavata* Rudolphi; collected by Mr. S. E. Meek, Fulton Market, New York, from the stomach of a mackerel, Aug. 30, 1886. Length, 10 mm.; lateral alæ very prominent. Probably young of *A. clavata*, but postanal region more elongate than usual in that species. On May 3 and 8, 1899, I received from Dr. H. M. Smith about 80 specimens of nematodes (*Ascaris* sp.) taken from mackerels from the New Jersey coast—the smallest specimen about 10 mm., the others 15 mm. to 20 mm. in length. One only is adult—a female 40 mm. in length. One male was noted with a curved spiculum, which had a strong, opaque costa and a rather broad, transparent blade. Many of the smaller specimens are of the type described under the names *Agamonema capsularia* and *Ascaris capsularia* [figs. 181, 182]; others are undoubtedly ascarids. All are probably immature ascarids. Other immature nematodes from the peritoneum have been collected from the mackerel, July 24, 1889, and Aug. 12, 1899. Specimens collected by Mr. Meek, Aug. and Nov., 1886, were probably all young ascarids, although the characteristic jaws of that genus have not yet developed. The longest of these measured 28 mm. It agrees closely with Leidy's description of *Agamonema papilligerus* Diesing.

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. Aug. 2 and 3, 1899; July 9, 1900; numerous. For account of similar forms, see **4**, pp. 789–792.
3. *Dibothrium* sp. Young and larva. Intestines. July 9, 1900; a young specimen with about a dozen segments, very active; resembles *Dibothrium punctatum* (**2**, p. 731). Also a flask-shaped larva 2 mm. in length when at rest, but capable of stretching to much greater length.
4. *Rhynchobothrium imparispine* Linton. Encysted. **4**, p. 800.
5. *Rhynchobothrium speciosum* Linton. Encysted. **4**, p. 802.
6. *Rhynchobothrium bulbifer* Linton. [Pl. XXI, fig. 244.] Aug. 2, 1899. Encysted in muscles of back.

TREMATODES.

7. *Distomum vitellosum* Linton. See **7**, p. 290, pl. XXXVII, figs. 38, 39. Aug. 2, 1899; July 9, 1900.

A few small distomes which agree with this species in essential characters were seen on the two dates given. These were very active and assumed such a great variety of shapes that they can not be characterized briefly. Within the space of a second or two the length may change from 0.7 mm., for example, to three times that length or more. The vitellaria are opaque dead-white, other portions translucent bluish-white. Ova, few, rather large, dimensions the same as those given for *D. vitellosum*. In death the worms are cylindrical, acetabulum prominent, neck sometimes reflexed. This remark applies to those distomes which in this paper are referred to this species. The characteristic subangular appearance of the vitellaria is not evident in the living specimens.

8. *Distomum appendiculatum* Rudolphi. Aug. 2, 1899; few. Aug. 12, 1899; 30. **7**, p. 289, pl. XXXVI, figs. 25, 26.

These appendiculate distomes agree exactly with those from the flounder, which were referred with much hesitation to *D. appendiculatum*.

Gymnosarda pelamys, *Ocean Bonito.*

1. *Tristomum lave* Verrill. Gills. **6**, p. 509, pl. XL, figs. 7, 8.

Thunnus thynnus, *Horse Mackerel.*

FOOD.

I had no opportunity to examine this fish for parasites until the summer of 1900. On July 16 the head (weight, 184 pounds) and viscera of a specimen, taken in a fish trap at Menemsha Bight, on the 14th were brought to Woods Hole. The only indication of the character of the food was the jaw of a squid in the intestine. The only entozoa were two distomes in the stomach.

TREMATODES.

1. *Distomum claratum* Rudolphi.

Larger specimen 17 mm. long and 7 mm. in greatest diameter. The smaller was 15 mm. and 5 mm. in the corresponding dimensions. See **6**, pp. 539–540, pl. LIII, figs. 8–11.

Sarda sarda, *Bonito.*

FOOD.

The stomachs of bonitos which I have examined have usually been empty, but occasionally I have found fragments of fish and squid in the alimentary canal. See also **7**, pp. 277–278.

NEMATODES.

1. *Ascaris* sp. [Pl. V, figs. 37–40.]

Eight in stomach of one fish July 15, 1899. Length of male, 25 mm.; of female, 40 mm. Anal papillæ much as in *A. habena*. On each side there are 5 small postanal papillæ and 10 small preceded by at least 20 larger preanal papillæ. The jaws are prominent and two-toothed. The cuticle was imperfect in most of the specimens, as if it had been attacked by the digestive fluids.

2. *Immature nematodes* (*Ascaris*).

U. S. National Museum collection; U. S. Fish Commission, 1883. The label reads: "Side of bonito, external." Length, 12 mm.; diameter, 0.26 mm. Posterior end acute, but truncate at tip.

3. *Ichthyonema* sp. July 25, 1899. An *Ichthyonema*, possibly more than one, in a tangled mass beneath the skin in gill cavity; flat and ribbon-like, with eggs, but no young in uterus.

CESTODES.

4. *Larval cestode*, on pyloric cæca. **7**, pp. 278, 300, pl. XLII, fig. 100. Also see **4**, p. 789, pl. LXI, figs. 2, 3.
5. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. Aug. 10, 1899; few. For account of these forms see **4**, pp. 789–792.
6. *Rhynchobothrium*. In cysts of stomach wall. **4**, p. 795. July 31 and Aug. 9, 1899.
7. *Tetrarhynchus bicolor* Bartels. **7**, p. 277. See **4**, pp. 813–815.
8. *Tetrachynchus*. Encysted in stomach wall. **7**, p. 278.

TREMATODES.

9. *Distomum vitellosum* Linton. Intestine. See **7**, p. 290, pl. XXXVII, figs. 38, 39. Aug. 23, 1900.
10. *Gasterostomum arcuatum* Linton. **7**, pp. 277–278, 297–298, pl. XLI, figs. 85–90. July 15, 1899; from four hosts, 18; from five hosts, 22. Aug. 10, 1899; from three hosts, several. Aug. 19, 1899; 5. July 30, 1900; 36 from three fish.

These occur most commonly in the pylorus, but were found in the stomach, pyloric cæca, and intestine. In one instance both young and adult were found together in the intestine.

11. *Hexacotyle thynni* De la Roche (?). [Pl. XXVII, figs. 296–298.] Aug. 7, 1900; 1, from mouth. Collected by Mr. R. P. Cowles.

Dimensions in millimeters, specimen somewhat flattened: Length, 7.5; breadth of body, middle 2, posterior 1.9, neck 0.55; length of neck, 0.94, the anterior tip tapering to 0.15 in a distance of 0.3; each of the six sucking disks 0.46 and 0.36 in the two principal diameters.

Scomberomorus maculatus, *Spanish Mackerel.*

FOOD.

The stomachs of all the specimens which I have examined have been empty. The food habits are doubtless the same as those of the nearly related *S. cavalla*.

NEMATODES.

1. *Ascaris incurva* Rudolphi (?). Fragment, from intestine. July 30, 1900.

A female with ova developing in uterus. Dimensions in millimeters: Length, 23; diameter, 1.75; diameter at anal aperture, 0.16; distance from anal aperture to posterior tip, 0.65.

2. *Ascaris clavata* Rudolphi. Immature. From stomach. Collected by S. E. Meek, Fulton Market, New York, Aug. 30, 1886. Length of longest specimen, 40 mm.

The bodies are rather thick, tapering somewhat quickly at anterior end, less so at posterior. One ala terminates on upper lip, the other on the left lower lip. In the larger specimen the vulva was situated 14 mm. from the anterior end.

3. *Immature nematode*. Encapsuled on viscera. Aug. 13, 1889; fragment. Dimensions in millimeters: Length, 10; greatest diameter, 0.4; diameter at anal aperture, 0.13; distance of anal aperture from posterior tip, 0.45. Body crossed by fine lines, making sharply serrate outline. [Pl. XIV, fig. 172.]
4. *Ichthyonema globiceps* Rudolphi. From ovary. Collected by S. E. Meek, Oct., 1886. Fish from New Jersey coast.

The specimens were first seen by me after they had been preserved in alcohol. They are immature. The aggregate length of the fragments in the vial is 120 mm. These represent two specimens. The diameter is uniform throughout and is about 0.18 mm.

CESTODES.

5. *Synbothrium filicolle* Linton. Cysts on viscera. **4**, p. 815.
6. *Rhynchobothrium bulbifer* Linton. Cysts on viscera. July 21, 1900. See **4**, p. 793.
7. *Rhynchobothrium speciosum* Linton. Cysts on viscera. July 30, 1900. See **4**, pp. 801–805.

TREMATODES.

8. *Gasterostomum* sp. Intestine. [Pl. XXXIV, figs. 369–372.] July 21 and 30 and Aug. 13, 1900; 12 hosts in all.

This is probably a new species near *G. arcuatum*. Neck and body crossed by fine transverse striæ, which under high magnification are resolved into transverse rows of exceedingly fine, short, bristle-like spines. Dimensions in millimeters: Length, 2.1; diameter, anterior 0.2, maximum diameter, at about 1½ mm. from anterior end, 0.31; anterior sucker, length 0.14; breadth of acetabulum 0.29, length 0.26; ova, 0.017 and 0.014 in the two principal diameters. In one of the specimens there were ova of two kinds. The smaller had thick shells with dimensions as given above. These were most abundant. In addition to these there were a considerable number of larger oval eggs with thinner shells in the uterus just back of the acetabulum. The dimensions of these in life were 0.028 and 0.024 in the two principal diameters. In the preserved specimens the contrast between these ova is not so great as in life. The vitellaria are as in *G. arcuatum*, viz, 16 on each side in two lateral clusters in front of the acetabulum. Two sets of comparatively coarse diagonal fibers crossing each other (fig. 370) constitute a conspicuous feature of the body wall in the neck of a stained specimen.

9. *Distomum* (*Köllikeria*) sp. Cysts in intestinal wall. Aug. 13, 1900. [Pl. XXXIV, fig. 366.]

Only a few of these cysts were collected, it being supposed from their appearance that they contained degenerate connective tissue. All but one consisted of but little more than a mass of small ova. Dimensions in millimeters: Longer diameter of reniform mass 1.74, shorter diameter 1.09; diameter of neck (?), 0.13; ova, 0.015 and 0.01 in the two principal diameters. Color, yellow and white intermingled.

Scomberomorus cavalla, *Cero.*

FOOD.

Bones of fish, pen and other parts of squid in stomach. Stomach usually empty.

CESTODES.

1. *Synbothrium filicolle* Linton. **4**, p. 818.

Scomberomorus regalis (*Cybium regale*), *King-fish, Cero.*

FOOD.

Fragments of small fish in stomach. In most cases the stomach was empty.

CESTODES.

All from cysts on viscera.

1. *Rhynchobothrium* sp. **4**, p. 794. Aug. 18, 1899.
2. *Tetrarhynchus* sp. **4**, p. 808.
3. *Synbothrium filicolle* Linton. **4**, pp. 811–818. Aug. 18, 1899.

Tetrapterus imperator (*Tetrapterus albidus*), *Spear-fish.*

NEMATODES.

1. *Ascaris incurva* Rudolphi.

U. S. National Museum collection. Label: "From rectum of *Tetrapterus*, Penikese, B. G. Wilder; August 5." There are twenty-four specimens in the lot, the largest 88 mm. in length and 3 mm. in greatest diameter; diameter of head, 0.4 mm. Nematodes, probably of this species, were obtained from the intestine of a spear-fish at Woods Hole, August 8, 1885, and turned over to B. F. Koons, Mansfield, Conn.

CESTODES.

2. *Dibothrium manubriforme* Linton. Intestine. **1**, pp. 456–458, pl. I, figs. 1–4. **2**, pp. 728–731. **5**, p. 429.
3. *Tetrarhynchus* (?). Cysts on intestine. **4**, p. 809.

Istiophorus nigricans (*Histiophorus gladius*), *Sail-fish.*

CESTODES.

1. *Dibothrium manubriforme* Linton. See under *Tetrapterus imperator*, No. 2.

Xiphias gladius, *Sword-fish.*

FOOD.

Fish and squid.

NEMATODES.

1. *Ascaris incurva* Rudolphi. Stomach. [Pl. IV, figs. 29–32.]

U. S. National Museum collection; Casco Bay, Me., 1873. United States Fish Commission steamer *Albatross*, near station 2091, 1883. Woods Hole, Mass., July 25, 1885. Numerous specimens in each lot. In the last lot one of the females measures 93 mm. in length; the genital aperture is 30 mm. from the anterior end. Some small specimens, 12 mm. in length, are the young of this species. The following note was made at the time of collecting: One of the largest measured 267 mm. in length and 3 mm. in diameter. Some of the worms were of a greenish color; smaller ones, with a red-brown stripe; very small ones, hair-brown; two or three, quite dark brown.

CESTODES.

2. *Dibothrium plicatum* Rud. Intestine. **2,** pp. 746–750, pl. III, figs. 1–6. **5,** pp. 430–431. **7,** p. 278.
3. *Rhynchobothrium attenuatum* Rudolphi. Peritoneum. **1,** pp. 805–806, pl. LXV, figs. 8–11. **7,** p. 278.
4. *Tetrarhynchus bicolor* Bartels. Peritoneum and mesentery. **1,** pp. 813–815, pl. LXVIII, figs. 1–6.

TREMATODES.

5. *Tristomum coccineum* Cuvier. Gills. **6,** pp. 509–510, pl. XL, fig. 9. **7,** p. 278.
6. *Distomum clavatum* Rudolphi. Stomach. **6,** pp. 539–540, pl. LIII, figs. 8–11.

COPEPODS.

7. *Philichthys xiphiae* Steenstrup. July 19, 1900.

Six specimens of this parasite were found by Mr. C. F. Silvester in the frontal sinuses of a sword-fish head which he was dissecting. These were females, with egg cases along the sides, held in place between the dorsal and ventral rows of lateral outgrowths of the body, and ranging in length from 14.5 to 27 mm. General color white, becoming a very faint salmon on swollen lobes toward anterior end; body along median line slightly darkened by intestine showing through. Egg masses dark olive. Dimensions of largest specimen in millimeters: Length, 27; breadth of body at anterior lobes, 8; at middle, 3; at middle including outgrowths, 10.5.

Naucrates ductor, *Pilot-fish.*

But one specimen examined; no entozoa found. **7,** p. 278.

Seriola zonata, *Pilot-fish.*

FOOD.

Stomach contents of specimen examined August 16, 1889, half digested fish, probably butter-fish.

NEMATODES.

1. *Ascaris incurva* Rudolphi. Stomach.

Two females, collected August 16, 1889. Dimensions of one in millimeters: Length, 22; diameter of head 0.19, 1 mm. back of head 0.28, maximum 0.9, 1 mm. from posterior end 0.36, at anal aperture 0.17; length of head, 0.12; distance from anal aperture to posterior tip, 0.36; distance of reproductive aperture from anterior end, 5.5.

CESTODES.

2. *Tetrarhynchus bisulcatus* Linton. Encysted, stomach wall. **1,** pp. 810–811, pl. LXVI, figs. 11–15.

Decapterus macarellus, *Mackerel Scad.*

FOOD.

Only young specimens, 5 inches and under, have been examined. Copepods found in alimentary canals of most of them; annelids were found in one lot along with copepods; about 200 fish examined in July and August, 1899 and 1900.

CESTODES.

1. *Cestode larva.* Intestines. [Pl. xx, fig. 228, *a–e.*]

Shaped something like a spool, with flaring sharp-edged flanges, but changing its shape in a remarkable manner, and its length from 1 to 4 mm. September 1, 1900.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small. Free in intestine. See **4**, pp. 789–792.

Found in eight out of nine lots examined. Two red spots in neck and a single costa on the bothria in specimens collected September 1, 1900.

3. *Rhynchobothrium* (?). Immature larvæ in cysts on viscera. July 31, 1899.

4. *Tetrarhynchus bisulcatus* Linton. Cyst on viscera. [Pl. xxi, fig. 243.]

A single scolex, collected August 18, 1900, resembles this species, except that the hooks are rather more slender. The borders of the bothria were provided with a band of very minute, dense, bristle-like spines. Calcareous bodies unusually abundant, mostly oblong-elliptical in outline and uniformly distributed in the parenchyma; largest 0.024 mm. in principal diameter. Diameter of proboscis, including hooks, 0.06 mm.; without hooks, 0.034 mm. Length of hooks, 0.024 mm.

TREMATODES.

5. *Distomum appendiculatum* Rudolphi. Intestine. [Pl. xxviii, figs. 312–314.] See **7**, p. 289, pl. xxxvi, figs. 25, 26. July 31 and Aug. 2, 1899. Aug. 18 and 22, 1900; few.

These distomes were very active, and when stretched to their extreme length became almost filiform, except in the vicinity of the suckers. As these worms contract very much when they are placed in the killing fluid, unless kept compressed, but little idea of their appearance in life can be gained from a study of alcoholic specimens. One of these distomes taken August 22, 1900, revealed a structure of the vitellaria, which suggested *D. monticellii.* It was one of the smaller distomes of the lot and differed in general appearance from the larger principally in the absence of ova (see figs. 313 and 314). The dimensions of the ova in these distomes differ from those which I have recorded for *D. appendiculatum* in my report for 1898 [**7**, p. 289]. Dimensions in millimeters, life: Length 2.47; diameter of oral sucker 0.15, of ventral 0.35; ova, 0.014 and 0.01 in the two principal diameters.

6. *Distomum rittellosum* Linton. See **7**, p. 290. Aug. 2, 1899; Aug. 29, 1900.

Two distomes on former date and one on latter, with prominent acetabula, belong to the species referred to in this paper under this specific name. The one taken August 29 was compared with specimens from a young blue-fish taken on the same day, while the worms were alive, and found to agree specifically.

Trachurops crumenophthalmus, *Big-eyed Scad.*

FOOD.

Two small specimens examined August 15, 1899, had in the alimentary tracts the jaws, spines, and other fragments of annelids.

NEMATODES.

1. *Immature* (*Ascaris*). Encapsuled.

TREMATODES.

2. *Distomum appendiculatum* Rudolphi. See **7**, p. 289, pl. xxxvi, figs. 25, 26.

This is a small specimen. Length, in alcohol, 0.65 mm.; diameter, 0.26 mm. It appears to belong to the species recorded in this paper as *D. appendiculatum.*

Caranx crysos, *Yellow Cavalli.*

Aug. 28, 1900; 13 young examined. Shrimps very abundant in alimentary canal.

CESTODES.

1. *Rhynchobothrium.* Cysts, peritoneum. **4,** p. 794, pl. LXII, figs. 13–15.

Vomer setipinnis, *Dollar-fish.*

Examined only on one occasion, August 5, 1887. No entozoa found.

Pomatomus saltatrix, *Blue-fish.*

FOOD.

Stomachs of adult with fish (hake, herring, scup, cunner) and squid. Smaller individuals had in their alimentary canals small fish, as a rule, but shrimp and amphipods were also found.

ACANTHOCEPHALA.

1. *Echinorhynchus proteus* Westrumb. **1,** pp. 496–497, pl. VI, figs. 3–5. **3,** pp. 537–538, pl. IX, figs. 85–88. Aug. 15, 1899; July 21, 23, 1900; Aug. 13, 1900. In intestine, usually with the head perforating the intestinal walls.
2. *Echinorhynchus incrassatus* Molin. Peritoneum. **3,** pp. 533–534, pl. LVIII, figs. 54–69*a*.
3. *Echinorhynchus sagittifer* Linton. Peritoneum. **1,** pp. 493–496, pl. VI, figs. 1, 2. **3,** pp. 535–536.

NEMATODES.

4. *Immature nematodes.* Encapsuled on viscera. **7,** p. 278. Aug. 15, 1899; July 21, 23, 1900; Aug. 13, 1900. [Pl. X, figs. 100–106.]

Found also on many occasions in previous years encapsuled on the viscera. A common form is identical with that from the squeteague (fig. 107); length of one, 10.5 mm. Another common form is larger (18 mm. to 28 mm.). In the larger specimens the characteristic head of *Ascaris* may be made out through the investing membrane. The posterior end in this form is bluntly rounded with a sharp mucronate tip. A small specimen, 9 mm. in length, differed from the foregoing by having the postanal region roughened as shown in fig. 120, from *Stenotomus.*

One lot from the outer coats of the stomach, collected by S. E. Meek, Fulton Market, New York, October, 1886, represent a more advanced stage of development than the foregoing. (See figs. 100–104.) The body is thickest anteriorly and is covered with a thin embryonic investment. The large intestine ends abruptly in a short and comparatively narrow rectum, with a top-shaped anal gland on the left side and another on the dorsal side, both near the termination of the intestine proper (fig. 104). Dimensions of one in millimeters: Length, 20; diameter of head 0.14, 2 mm. back of head 0.34 maximum 0.34, 2 mm. from posterior end 0.24, at anal aperture 0.16; distance of anal aperture from posterior end, 0.26; length of œsophagus, 2.6.

5. *Ichthyonema globiceps* Rudolphi. Ovaries. [Pl. XVIII, figs. 211–215.] August, 1884.

Dimensions of alcoholic specimen in millimeters: Length, 150; diameter of globular anterior extremity of œsophagus 0.15, of œsophagus behind anterior end from 0.07 to 0.09, of intestine near œsophagus 0.04; length of œsophagus, 1; diameter of body (maximum), 1; diameter one-half millimeter from posterior end, 0.5; length of embryos from 0.2 to 0.36; greatest diameter of embryos 0.014. The color of the alcoholic specimen is yellowish white, with the intestine showing as a relatively broad, dark-brown stripe. The intestinal walls have an abundant deposit of pigment and are traversed by transparent anastomosing lines, which produce an effect which resembles the venation of a leaf. The embryos, which are in myriads, appear to have escaped into the body cavity by rupture of the uterus. They are blunt at one end and exceedingly slender, even flagellate, at the other.

CESTODES.

6. *Dibothrium crassiceps* Rudolphi.

July 21, 1900; 36 scolices obtained from one fish. The longest of the strobiles, none of which are mature, was 40 mm. Scolex nearly globular; when at rest broader than long in some. (See No. 3, under *Merluccius bilinearis*.) [Pl. XVII, figs. 142–144.]

7. *Rhynchobothrium bulbifer* Linton. Cysts on viscera. **4**, p. 793. Aug. 3, 1900.

8. *Rhynchobothrium speciosum* Linton. Cysts on viscera. **4**, pp. 801–805, pl. LXIV, figs. 13–14, and pl. LXV, figs. 1–7. **7**, p. 278. July 21, 23, 1900; Aug. 13, 1900.

9. *Tetrarhynchus bisulcatus* Linton.

Usually present in great abundance in cysts in the stomach wall; best seen by separating the muscular coats from the submucosa, when the cysts will be seen lying in the submucosa. **1**, p. 486 (*R. bisulcatus*). See also **4**, pp. 810–811. **7**, p. 278. July 21, 23, 1900; Aug. 1, 1900.

10. *Tetrarhynchus erinaceus* Beneden. Cysts on viscera. See **4**, pp. 811–812, pl. LXVII, figs. 1–8. Aug. 13, 1900.

11. *Otobothrium dipsacum* Linton. **4**, pp. 806–807, pl. LXVI, figs. 1–5.

12. *Syndothrium filicolle* Linton. Cysts on viscera. **4**, p. 818. **7**, p. 278. July 21, 23, 1900; Aug. 1, 13, 1900.

In specimen examined Aug. 1 several large cysts were found on spleen, pyloric cæca, and intestine, and one in submucosa of stomach. Cysts with degenerate contents. July 23, Aug. 11, 1900.

13. *Larval cestodes* (*Scolex polymorphus* Dujardin). Small, free in intestines. See **4**, pp. 789–792. Aug. 26, 1899; July 21, 1900.

TREMATODES.

14. *Distomum monticelli* Linton. Intestine. See **6**, pp. 518–520, pl. XLIV, figs. 2–8. July 27, Aug. 11, 14, 1899; 10 in all.

15. *Distomum* sp. [Pl. XXXI, figs. 341–344.]

Brief mention is here made of a few small distomes found on the following dates: August 14, 17, 26, 1899; August 18, 1900. They are characterized by being covered with low, flat spines as in *D. dentatum*, mouth unarmed, suckers of about equal size, and œsophagus longer than pharynx. The body is white, depressed, usually oval, but elongated forms also seen, both forms occurring in same lot. Similar forms were found in the flounder (fig. 345) and scup (fig. 346); spineless distomes agreeing in other respects with these were seen in the flounder (fig. 352), and in the butter-fish (fig. 353); a related form from the mummichog is shown in fig. 354.

16. *Distomum vitellosum* Linton. [Pl. XXX, figs. 337–339.] See **7**, p. 290, pl. XXXVII, figs. 38, 39. Aug. 26, 1899; July 21, 1900; Aug. 18, 25, 29, 1900.

I here record examples from the blue-fish of a species of distome found in a number of hosts which I have entered in my notes as small, cylindrical, with prominent acetabulum. In many cases, where tap water was used for washing out the contents of the alimentary canal, distomes were found which had been killed by contact with the fresh water. Under such conditions the distome assumed a characteristic position in which the neck was reflected nearly at right angles to the body. In sea water or in salt solution the worm remains active and is then seen to be of very varying form. The species is near *D. simplex*. See remarks under No. 6 of *Microgadus*.

17. *Microcotyle* sp. From gill filaments. [Pl. XXVII, figs. 299–306.]

Prof. C. B. Wilson, while collecting parasitic copepods from the gills of a large blue-fish, September 3, 1900, called my attention to some trematode worms. These belong to the genus *Microcotyle*. They are slender, thin, and strap-like worms, attenuate both anteriorly and posteriorly. They attach themselves to the gills by the posterior part of the body, which, for a third of its length, is provided with a great number of minute suckers. The worms were very active with the body proper, although remaining firmly attached to the gill filaments, in which position they were killed. They were transparent, bluish white, the vitellaria marginal and dark brown. They were collected just as I was about to leave Woods Hole, so that but little time was available for the study of the living worms.

Dimensions of a specimen in glycerine, measurements in millimeters: Length of body proper 4, of posterior sucker-bearing portion 4; diameter of body, maximum 1.5, of posterior sucker-bearing portion 0.57 near body and 0.37 near tip; diameter of single posterior sucker, 0.065; diameter of anterior end through suckers, 0.25; anterior suckers, two in number, 0.11 in length, 0.10 in breadth; pharynx, seen only in dorsal view, adjacent to suckers, length 0.07, breadth 0.05; length of ovum exclusive of filaments, 0.21. Length of body in another specimen, 7; maximum diameter, 1.5; length of posterior sucker-bearing portion, 4. The number of posterior suckers is about 90 in each row, or 180 in all.

Rachycentron canadus, *Cobia, Crab-eater.*

FOOD.

A specimen taken in Buzzards Bay, July 15, 1899, was kept in a large pool at the Fish Commission laboratory until August 31, when it was examined for parasites. The stomach contained large numbers of bones, mostly vertebræ of fish (squeteague, etc.) from which the flesh had been entirely digested.

NEMATODES.

1. *Ascaris inquies*, sp. nov. [Pl. VI, figs. 46–50.]

The stomach contained a large number of nematodes, which were very active and remained active for several hours in sea water. Indeed, they showed no tendency to come to rest at the time they were put in the killing fluid. While these worms have not yet been worked up, the following brief characterization may be given in this preliminary report. The general color of the body in life was dark ashy brown; head and anterior part of the body to the base of the œsophagus white. Jaws prominent, head wider than neck, which is sharply serrated, being crossed by fine transverse lines at regular intervals. Posterior end acuminate. The preanal papillæ appear to be about 24 on each side, the posterior 10 of these small; postanal papillæ not seen distinctly, probably 4, very small. The following measurements of a female in acetic acid are given in millimeters: Length, 40; length of œsophagus, 2.47; length of head 0.16, breadth 0.29; diameter of neck at head, 0.16; maximum diameter of body near posterior end, 0.8; diameter 1 mm. from posterior end, 0.44; diameter at anus, 0.44; distance of anus from posterior tip, 0.51; distance between striæ on neck, 0.024.

Coryphæna hippurus, *Dolphin.*

The specimens which were brought into the laboratory had been eviscerated so that only cestodes encysted on the peritoneum were seen. The nematodes mentioned here are from the U. S. National Museum collection.

NEMATODES.

1. *Ascaris incrassens* Molin. Stomach. Collected June 24, 1887. [Pl. VIII, figs. 62–64.]

Dimensions of one of the largest in millimeters: Length, 43; diameter of head 0.17, 2 mm. back of head 0.24, middle 0.7, at anal aperture 0.28; distance from anal aperture to posterior tip, 0.34; length of male spicules, 3. Tip of tail of one mucronate with short spines. These specimens are referred to this species provisionally.

CESTODES.

2. *Rhynchobothrium* sp. [Pl. XXI, figs. 239, 240.]

August 23, 1899. From large blastocyst 30 mm. in length, 5 mm. in diameter at anterior end, tapering to point at posterior end. The larva measured 15 mm. in length. The hooks of this specimen were not seen, but the general appearance of the larva, as well as of its blastocyst, is much like that of *R. speciosum*.

3. *Tetrarhynchus bicolor* Bartels. **4**, pp. 813–815, pl. LXVIII, figs. 1–6.

Also found both free and encysted on peritoneum of two dolphins, Aug. 23, 1899. Pedunculated cysts with network of capillaries on exterior, when opened, liberated an active larva.

TREMATODES.

4. *Distomum tornatum* Rudolphi. **6**, pp. 513, 514, pl. XLII, figs. 6–12. See No. 3 under *Menidia notata*.

Palinurichthys perciformis, *Rudder-fish.*

FOOD.

Squid, small crustaceans, univalve mollusks. (**7**, p. 279.) Salpa and a slender green alga found in the alimentary tracts of two fish from Menemsha, September 1, 1900.

ACANTHOCEPHALA.

1. *Echinorhynchus pristis* Rudolphi. Intestine. (Variety *tenuicornis*.) **3**, pp. 531–532, pl. LVI, figs. 39–41, and pl. LVII, figs. 42–53. **7**, p. 279.

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in alimentary tract. **4**, pp. 789–792, pl. LXI, figs. 4–15. **7**, p. 279. Found also Sept. 1, 1900.

TREMATODES.

3. *Distomum pyriforme* Linton. Intestine. **7**, pp. 279, 292–293, pl. XXXVIII, figs. 52–59. Found Sept. 1, 1900.

Rhombus triacanthus (*Stromateus triacanthus*), *Butter-fish.*

FOOD.

Stomachs of larger fish usually empty, but a few fragments of fish occasionally seen. In the alimentary tracts of smaller specimens copepods, annelids, and small fish were found. Sept. 1, 1900, 25 small fish were examined. The food consisted principally of amphipods.

ACANTHOCEPHALA.

1. *Echinorhynchus sagittifer* Linton. July 24, 1900. Encapsuled on viscera. See **1**, pp. 493–496, pl. VI, figs. 1, 2. **3**, pp. 535–536, pl. LIX, fig. 80.

NEMATODES.

2. *Cucullanus* sp.

U. S. National Museum collection; Vineyard Sound; V. N. Edwards, collector. One female, with segmenting ova; œsophagus sinuous; body of nearly same diameter throughout. Dimensions in millimeters: Length, 9; diameter, 0.38; length of œsophagus, 0.5; diameter of œsophagus 0.05, at anterior end 0.09; diameter of head, 0.12.

3. *Immature nematodes.* On viscera. [Pl. XII, figs. 132, 133.] **7**, p. 279.

Very abundant. Found in the majority of specimens examined in 1899 and 1900; small, pale red; particularly abundant on pyloric cæca. A specimen found in the stomach of a sea bass yielded a large number of these worms. If the process of digestion had proceeded a little further, the sea bass would have been the accredited host of these nematodes. Dimensions in millimeters: Length, 13; diameter, head 0.14, 1 mm. from head 0.28, maximum (toward posterior end) 0.34, 1 mm. from posterior end 0.28, at anal aperture 0.23; distance from anal aperture to posterior end, 0.36.

CESTODES.

4. *Rhynchobothrium.* Cysts on viscera. **7**, p. 279. Numerous examples were found in the summers of 1899 and 1900.

An interesting case of abnormality was noted in a specimen collected July 27, 1899. Only one-half the larva—i. e., one bothrium with its pair of proboscides, including the contractile bulbs—was present. This could not have been a case of mutilation, since it was seen to be abnormal when it issued from the blastocyst while under the compressor. The hooks on the retracted proboscides of this specimen resemble those of *R. bulbifer*.

5. *Rhynchobothrium.* Cysts in muscles. [Pl. XXIII, figs. 255–256*a*, and pl. XXIV, fig. 265.]

On August 26, 1899, two butter-fish, which had been cleaned and prepared for the table, were submitted to me by Dr. F. Judson Herrick, who, after having had an opinion rendered regarding their condition, decided to allow them to be devoted to the cause of science. The muscles between the ribs contained great numbers of small cysts. When one of these was compressed, a blastocyst was liberated,

from which, upon further pressure, a larval cestode (*Rhynchobothrium* sp.) could be obtained. Forty of these cysts were counted in a space 4 mm. square.

Similar conditions were observed in a butter-fish brought to me by Mr. E. E. Tyzzer, August 17, 1900, and in another examined the following day.

In these cases enormous numbers of cysts were seen in the muscles. They were most abundant on the ventral side of the vertebral column, between the subvertebral spines. They were also scattered through the dorsal region, lying deep among and near the dorsal vertebral spines. The cysts are small, oval, about 1 mm. in length and somewhat less in shorter diameter. One measured 1.3 mm. in length and 0.87 mm. in diameter. The contained blastocyst measured 0.87 and 0.67 mm. in the two principal diameters. Dimensions of the larva in millimeters: Length, 0.7; bothria nearly circular, 0.3 in diameter; diameter of neck, 0.1. Contractile bulbs very short.

6. *Tetrarhynchus*. Cysts on peritoneum. [4, p. 809. Some of these may belong to the genus *Rhynchobothrium*.

7. *Tetrarhynchus crimaeus* Beneden. See [4, pp. 811-812, pl. LXVII, figs. 1-8. July 27, 1900; several on viscera.

8. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. See [4, pp. 789-792. Found in summers of 1899 and 1900.

9. *Dibothrium angustatum* Rudolphi. Sept. 1, 1900. A few small specimens, the longest less than 10 mm. in length; head about 1 mm. long and 0.3 mm. or less in width. Very active. Joints narrow and irregular. Immature.

TREMATODES.

10. *Distomum gulosum* sp. nov. [Pl. XXVIII, fig. 315-317.]

Appendiculate distomes, apparently new. July 26, 1899; 16 specimens obtained from a lot of 4 butter-fish. Butter-fish were examined on seventeen different occasions in 1899 from July 17 to August 26. Dimensions of living specimens, slightly compressed, in millimeters: Length, 10; maximum diameter median, 1.14; length of appendix, 3.6; diameter of anterior sucker 0.36, of acetabulum 0.38; distance between suckers, 0.1; diameter of testes 0.47, of ovary 0.28; ova, 0.017 and 0.010 in the two principal diameters.

Body slender; neck tubular, slightly arcuate; neck and anterior part of body crossed by fine lines, which produce a sharply serrate outline; oral sucker nearly globular; mouth slightly subterminal, with longitudinal opening; pharynx tubular, almost as long as the oral sucker; œsophagus none; intestinal rami extending into the appendix, which is long and slender; genital aperture on ventral border of mouth; acetabulum nearly globular, its diameter not differing much from that of the oral sucker; seminal vesicle some distance behind acetabulum, followed posteriorly by the two smallish subglobular testes, which lie end to end; ovary globular, a short distance behind the testes; vitellaria about the middle of the body, behind the testes, tubular, as many as six tubules showing in sections; uterus voluminous, its folds extending into the appendix; ova numerous, small. Dimensions of a specimen mounted in glycerine, in millimeters: Length, 7.5; oral sucker, length 0.36, breadth 0.36; pharynx, length 0.33, breadth 0.18; acetabulum, length 0.32, breadth 0.33; distance from anterior end to acetabulum, 0.87; distance between acetabulum and testes, 1; distance between testes and ovary, 0.19; diameter, of neck 0.36, middle of body 0.65, posterior 0.15, of anterior testis 0.28, of posterior testis 0.25, of ovary 0.23; ova, 0.017 and 0.010 in the two principal diameters.

The alcoholic specimens show at least one important variation from the living worm, viz, in the relative size of the suckers. In one the suckers were of equal size, in another the acetabulum was less, and in another the anterior sucker was larger but of less transverse diameter than the acetabulum. The vitellaria are tubular, showing as many as six distinct masses in transverse sections of the body.

11. *Distomum* sp. [Pl. XXXII, fig. 353.]

Mention is here made of a few small distomes which require further study before a specific name can be assigned to them. Specimens were found on July 24 and August 14 and 23, 1899, which were small, oval, translucent, bluish-white, and spinose. Dimensions of a living specimen in millimeters: Length, 0.78; diameter of oral sucker, 0.064; of ventral sucker, 0.057.

These specimens suggest *D. piriforme*. Others collected July 26 and August 2, 15, 20, and 23, 1899, resemble these, but the habit of the body is much more slender. [Fig. 353.] Some of these suggested *Distomum* sp. from the scup [7, p. 296, pl. XXXIX, fig. 72], and *Distomum* sp. from the puffer [6, pp. 537-538, pl. LIII, figs. 1, 2]. Spines can not always be made out on these forms.

Dimensions of specimen sketched (fig. 353), life, in millimeters: Length, 1.46; diameter, anterior 0.1, middle 0.27, of oral sucker 0.07, of ventral sucker 0.07; ova, 0.075 and 0.058 in the two principal diameters. See also figs. 341–346, 352, 354.

PROTOZOA.

12. *Sporocyst*

From liver: White, globular, 1.5 mm. in diameter. When compressed it liberated immense numbers of spores, which were in large part aggregated into globular or oblong clusters, the larger as much as 0.02 mm. in diameter. The spores were short and thick, with bluntly rounded ends; length about 0.0025 mm., and a little less than that in breadth and thickness. Collected September 1, 1900. Specimen given to Dr. H. H. Cushing.

Roccus lineatus, *Striped Bass.*

FOOD.

The stomachs of all the specimens which I have examined have been empty. A few fish scales have been noted in the intestine.

ACANTHOCEPHALA.

1. *Echinorhynchus proteus* Westrumb. **1**, pp. 496–497, pl. VI, figs. 3–5. **3**, pp. 537–538, pl. LXVIII, figs. 85–88. July 14, 1900; 2 fish examined, 20 in one, 6 in the other. Two obtained from another July 21.

This parasite is apparently with rare exceptions always present in the rectum of the striped bass. Usually the head of the worm perforates the intestinal wall and is often surrounded by a waxy secretion, which is covered by the serous coat.

2. *Echinorhynchus acus* Rudolphi. **1**, pp. 492–493, pl. V, figs. 7–13. **3**, pp. 525–528, pl. LIII, figs. 1–11, and pl. LX, figs. 89, 90.

NEMATODES.

3. *Ascaris* sp. Immature.

In a striped bass examined August 18, 1887, numerous small capsules were found between the mucous and submucous layers of the stomach. These were more or less elongated, some even vermiform, and were dark-brown on account of the waxy, degenerate tissue with which they were surrounded. These capsules contained nematodes. The head of the one examined was truncate, with indistinct papillæ. The tail tapers to a smooth, round point, somewhat elongate behind the anal aperture. The body is crossed by exceedingly fine striæ. The œsophagus is long, with a cæcal appendage at its base. These forms resemble those from the squeteague. [Figs. 107–109.]

4. *Filaria rubra* Leidy.

From flesh. Collected by S. E. Meek, Fulton Market, New York, August 12, 1886, who says that the worm was red when living. The specimen is a fragment, the posterior end of a long worm; linear, slightly roughened by transverse wrinkles; length, 60 mm.; diameter, about 1 mm.

5. *Lecanocephalus annulatus* Molin. [Pl. XIX, figs. 220–223.]

One specimen, a male, from peritoneum, August 3, 1889. The specimen was in poor condition and but little more than the external characters could be made out. Some of the dimensions in millimeters are given: Length, 8; diameter of head 0.19, 1 mm. back of head 0.46, maximum (about middle) 0.61; length of copulatory spines, about 0.11; distance between the transverse dentigerous rows, about middle of body, 0.03.

CESTODES.

6. *Rhynchobothrium speciosum* Linton. See **4**, pp. 801–805, pl. LIV, figs. 13, 14, and pl. LXV, figs. 1–7. July 21, 1900. Elongated cyst on viscera.

TREMATODES.

7. *Distomum tornatum* Rudolphi. Intestine. [*D. ruforicide* Rudolphi.] **6**, pp. 515–517, pl. XLII, fig. 14, and pl. XLIII, figs. 1–4.

These specimens were wrongly identified. They should be referred to *D. tornatum*.

8. *Distomum tenue* Linton. **6**, pp. 535–536, pl. LII, figs. 2–8.

9. *Cysts in liver.* [Pl. XXVII, figs. 308, 309.]

These cysts, collected July 14, 1900, are a deep red brown, almost black by reflected light. They are globular, except where they lie so close as to touch each other. When cleared in acetic acid their structure is seen to be concentric. A granular nucleus of deeper color than the surrounding parts could be made out in each, but could not be identified. In one case two nuclei were seen. Those measured varied from 0.21 to 0.81 mm. in diameter, with the exception of one, a very small cyst, which lay touching a larger one and was flattened on the touching side, whose two principal diameters were 0.06 and 0.1 mm., respectively. It would appear that the tissues of this fish habitually build colloid cysts around foreign particles. A thin outer layer of the cyst is lighter colored than the inner part, and is evidently unmodified connective tissue. The smaller cysts have essentially the same structure as the larger. They are all confined to the surface of the liver.

Morone americana (*Roccus americanus*), *White Perch.*

FOOD.

Fish, shrimps, and other crustaceans.

ACANTHOCEPHALA.

1. *Echinorhynchus agilis* Rudolphi. Intestine. **1**, pp. 490–492, pl. v, figs. 1–6. **3**, pp. 534–536, pl. LIX, figs. 70–72.
2. *Echinorhynchus thecatus* Linton. **3**, pp. 528–529, pl. LIV, figs. 12–22.

TREMATODES.

3. *Distomum tenue tenuissime* Linton. Peritoneum. **6**, pp. 536–537, pl. LII, figs. 9–12.
4. *Distomum areolatum* Rudolphi. Intestine. **7**, pp. 279, 293–294, pl. XXXIX, figs. 60–63.
5. *Cysts with trematode ova.* Liver, etc. **6**, p. 537. **7**, p. 279.

Centropristes striatus (*Serranus atrarius*), *Sea Bass, Black Bass.*

FOOD.

Fish, squid, crabs (*Eupagurus, Panopeus, Platyonichus*, etc.).

ACANTHOCEPHALA.

1. *Echinorhynchus serrani.* Peritoneum. **3**, pp. 534–535, pl. LIX, figs. 73–79.
2. *Echinorhynchus sagittifer* Linton. Peritoneum. See **1**, pp. 493–496, pl. VI, figs. 1, 2. **3**, pp. 535–536, pl. LIX, fig. 80. July 30, 1889; in cysts on viscera.
3. *Echinorhynchus proteus* Westrumb. See **1**, pp. 496–497, pl. VI, figs. 3–5. **3**, pp. 537–538, pl. LX, figs. 85–88. Found among cysts collected in 1884.

NEMATODES.

4. *Immature nematodes* (*Ascaris*).

Found frequently in the mesentery, often very abundant. General characters are nearly uniform diameter, tapering at each end; tail mucronate. Agree with forms found in *Pomatomus, Cynoscion*, etc. Twenty-three bass, examined July 30, 1889, had each a large number of these worms, in most cases in a tangled mass on the mesentery and pyloric cæca. Many of these might be referred to the indefinite species *Ascaris capsularia.*

5. *Filaria rubra* Leidy. [Pl. XV, figs. 188–191.]

Found under the skin of a bass, Washington, D. C., October, 1891. Collected by Miss Sophia Oberheimer. The worm was bright red when alive. Dimensions of alcoholic specimen, in millimeters: Length, 125; diameter of head 0.4, 5 mm. from anterior end 0.65; median 0.8, 5 mm. from posterior end 0.75, one-half millimeter from posterior end 0.4.

CESTODES.

6. *Rhynchobothrium*, larvæ encysted on viscera. **4**, p. 793, pl. LXII, fig. 12. **7**, pp. 279–280. Aug. 4, 1900.
7. *Rhynchobothrium imparispine* Linton. On viscera. **4**, pp. 799–801, pl. LXIV, figs. 9–12.
8. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. See **4**, pp. 789–792. Aug. 4, 1900.

Lobotes surinamensis, *Flasher.*

ACANTHOCEPHALA.

1. *Echinorhynchus pristis* Rudolphi. Intestine. Variety *tenuicornis*. **3**, pp. 531–532, pl. LVI, figs. 39–41, and pl. LVII, figs. 42–53.

NEMATODES.

2. *Immature nematode* (*Ascaris*). Intestine. Collected Aug. 6, 1887. [Pl. XII, figs. 140–142.]

The worm is finely wrinkled transversely, tapers equally to head and tail; the tip of the latter is conical and covered with minute bristle-like but short papillæ. Dimensions in millimeters: Length, 11.25; diameter of head 0.12, 1 mm. back of head 0.32, maximum 0.34, 1 mm. from posterior tip 0.27, at anal aperture 0.11; length of upper lip, 0.08; distance from anal aperture to posterior tip, 0.11; length of œsophagus, 2.16.

3. *Ichthyonema globiceps* Rudolphi. Peritoneum. Aug. 3 and 6, 1887. [Pl. XVIII, figs. 209, 210.]

Two specimens in the first lot, 510 mm. and 580 mm. in length and 1.48 mm. in diameter. They are of nearly uniform diameter throughout and bluntly rounded at each end. The intestine is dark-brown for two-thirds of its length, white for the remaining third. It ends blindly at its posterior extremity. When the worm was subjected to pressure the young were discharged in vast numbers from a point about 1 mm. from the anterior end.

Dimensions of embryos in millimeters: Length, 0.4; diameter at larger end 0.008, maximum 0.013; smaller end attenuate, appearing as a mere line even when highly magnified. There are four dark-brown granular masses scattered along the middle region of the body and among them several light-colored refractile bodies. A slight notch was noticed at the larger end of some. A favorite position is with the larger end bent rather sharply; the slender end is often likewise bent, so that the two ends point toward each other. Where they occur in the greatest abundance in the parent worm they give to the latter a plump, even distended, appearance. After they have been discharged the parent is transparent, collapsed, much contracted, and quite irregular in outline, in places flattened and shriveled. The larger end is said to be the anterior. I was not acquainted with this assertion at the time of viewing the living worms, but supposed from the appearance and behavior of these embryos that the slender end is the anterior.

CESTODES.

4. *Symbothrium filicolle* Linton. On viscera. **4**, p. 815.

TREMATODES.

5. *Gasterostomum ovatum* Linton. Intestine. **7**, p. 297. (Linton: *Monostomum orbiculare* Rudolphi. **6**, pp. 541–542, pl. LIV, figs. 2–5.)

Stenotomus chrysops, *Scup.*

FOOD.

A few food notes were given in my report for 1898, pages 280–281. In the summer of 1899 I examined 58 large and 51 small scup on 17 different occasions from July 20 to August 30. In the stomachs of the larger, small fish and squids were most frequently found, but annelids, crabs, shrimps, amphipods, mollusks, and hydroids were also noted. The smaller contained copepods and other small crustaceans. Some small specimens from Katama Bay, August 30, had in their stomachs annelids, small crustacea, and small crepidulæ.

Twenty-six scup were examined in the summer of 1900, with practically the same results as given above, viz, fish, small crustacea of various kinds, annelids, small bivalve mollusks, and a young sea-urchin. Intestinal contents of a specimen taken August 29 revealed plates from the body walls of a holothurian. A few ova of *Distomum pyriforme* were seen in this material along with the holothurian plates, spines of annelids, and vegetable débris.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. On viscera. **3**, p. 527.
2. *Echinorhynchus sagittifer* Linton. July 24, 1900. See **1**, pp. 493–496, pl. VI, figs. 1, 2. **3**, pp. 535–536, pl. LIX, fig. 80.

NEMATODES.

3. *Ascaris* sp. [Pl. VIII, figs. 65-69.]

A small lot of ascarids in the U. S. National Museum collection from a scup which had been taken from the stomach of a cero (*Scomberomorus regalis*). These are thickest about the middle, rather more slender anteriorly than posteriorly; lateral alæ for about 1 mm. back of head; tail somewhat slender and prolonged beyond the anal aperture, decidedly appressed; body crossed by fine transverse lines, best seen toward posterior end. Dimensions in millimeters: Length, 45; diameter of head, 0.23, 4 mm. back of head 0.48, 10 mm. back of head 0.68; median, 1.28, 1 mm. from posterior end 0.45, at anal aperture (ventral view) 0.28; distance of anal aperture from posterior end, 0.85.

4. *Immature nematodes* (*Ascaris*). [Pl. X, figs. 110-116; pl. XI, figs. 117-120.]

Very common in body cavity on viscera. Found in at least 75 per cent of the scup examined in the past two summers; also noted repeatedly in previous years. A careful study of these forms is needed in order to fix their position. Some of them with the characteristic head of *Agamonema*, after the removal of the cuticle, revealed the unmistakable jaws of *Ascaris*. Measurements of one are given in **7**, p. 280. I add, for the purpose of comparison, measurements in millimeters, of a specimen from the viscera of a scup collected July 24, 1899: Length, 20; diameter, anterior 0.12, middle 0.5, at anal aperture 0.24; diameter of œsophagus, anterior 0.07, middle 0.08, base 0.12; length of œsophagus, 1.25; distance to nerve ring 0.57; distance of anal aperture from posterior end 0.45. In this specimen there was an intestinal diverticulum, short, bifurcate, prolonged cephalad, and a longer, more slender prolongation of the œsophagus. These immature forms are probably identical with those in the bluefish, squeteague, and others. Figures 117, 118 are sketched from a specimen collected by Mr. R. E. Earll, at Charleston, S. C., March, 1880. The capsules were mostly club-shaped, arcuate, or straightish; cuticle very finely transverse striate. Length, 22 mm.; diameter, 0.33 mm.

CESTODES.

5. *Rhynchobothrium imparispine* Linton. Encysted on viscera. Found in 1899. See **5**, pp. 799-801.
6. *Rhynchobothrium speciosum* Linton. On viscera. **5**, p. 802.
7. *Rhynchobothrium*. Encysted on viscera. **5**, p. 796, pl. LXIII, figs. 10-13. **7**, p. 280. Found in 1899 and 1900 in a large proportion of the scup examined.
8. *Tetrarhynchus bisulcatus* Linton. Stomach wall. **5**, p. 810.
9. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. **7**, p. 280. See **4**, p. 791. Seen frequently in 1899 and 1900.

TREMATODES.

10. *Distomum vitellosum* Linton. [Pl. XXX, figs. 333, 334.] See **7**, p. 290, pl. XXXVII, figs. 38, 39.

Seen often in 1899 and 1900, but always in small numbers. I append notes made on a specimen taken August 23, 1900. Worm small (1.2 mm. when at rest), very active while in sea water and salt solution, neck extremely mobile, stretching to thread-like thinness and contracting until the suckers were close together; general outline, proportions, and appearance of the body undergoing constant and perplexing changes; acetabulum much larger than oral sucker and kept expanded, i. e., its walls when the specimen was viewed from the side forming a semicircle or widely open C. When placed in fresh water the worm soon became turgid, with neck reflected, acetabulum contracted until its walls were close together, and distinctly pediceled. See under *Clupea harengus*, *Paralichthys dentatus*, etc.

11. *Distomum* sp. [Pl. XXXI, fig. 346.]

I here place certain small distomes, which appear to be near *D. pyriforme*, if not identical with that species, but until more material is available and a careful comparative topographical study of these small forms can be made it will be better perhaps to leave them without specific designation for the present. These are small, usually oval, flattened, white distomes, with minute spines. They were most numerous in small scup, seen frequently (but in small numbers) in this and other hosts. The identification of these distomes is difficult, on account of the spines, which apparently fall off easily. See No. 21 under *Paralichthys dentatus*, No. 11 under *Rhombus triacanthus*, and No. 15 under *Pomatomus saltatrix*. One of these distomes, collected August 29, 1900, was placed under slight pressure and seen in favorable conditions. Spherical bodies with concentric structure were present in the excretory vessels, and the cirrus was seen to be spinose. A cell from the germ gland was seen entering the shell mold. It appeared to be attached by a slender pedicel for a few seconds. It was surrounded by

spermatozoa, which were in active motion. Small masses of yolk, smaller than the germ cell, were also seen entering the mold. The distome noted in **7**, p. 296, pl. XXXIX, fig. 72, is a closely related form. See also No. 3 under *Lagocephalus laevigatus*.

12. *Distomum appendiculatum* Rudolphi. **7**, p. 289, pl. XXXVI, figs. 25, 26. One specimen found in this host Aug. 9, 1899.
13. *Globular cysts in kidneys.* **7**, pp. 280, 301. These are probably due to psorosperms.

RHYNCHOBDELLIDA.

14. *Pontobdella rapax* Verrill. **7**, p. 280. See under *Paralichthys dentatus*, No. 23.

Archosargus probatocephalus, *Sheepshead.*

ACANTHOCEPHALA.

1. *Echinorhynchus proteus* Westrumb.

Several specimens enveloped in connective tissue cysts from peritoneum of a fish from Chesapeake Bay. Collected by S. E. Meek, Fulton Market, New York, August 30, 1886. Several of the cysts contained degenerate connective tissue of a waxy consistency. The specimens were adult, the females containing the fusiform embryos characteristic of the species. One of the longer specimens measured 10.5 mm. in length.

Cynoscion regalis, *Squeteague, Weak-fish.*

FOOD.

Only large specimens were examined. The food is fish and squids; shrimps and amphipods found in a few cases. From the stomach of a specimen of average size, about 18 inches in length, examined July 31, 1900, there were taken two menhaden, each 9 inches long, one butter-fish, 4½ inches long, and one squid, 7 inches in length. A specimen examined on August 1, length 20 inches, had a menhaden 11 inches long in its stomach.

ACANTHOCEPHALA.

1. *Echinorhynchus sagittifer* Linton. On viscera. **1**, pp. 493–496, pl. VI, figs. 1, 2. **3**, pp. 535–536, pl. LIX, fig. 80.
2. *Echinorhynchus proteus* Westrumb. Intestine. **1**, pp. 496–497, pl. VI, figs. 3–5. **3**, pp. 537–538, pl. LX, figs. 85–88. **7**, pp. 280–281.

Found three times in 1899 and twice in 1900. Heads perforating intestinal walls as in *Roccus lineatus*. [Pl. II, figs. 12, 13.]

3. *Echinorhynchus pristis* Rudolphi. **3**, pp. 530–531, pl. LVI, figs. 31–38.

One found on viscera July 25, 1900. While the worm was living it was observed everting and inverting both the proboscis and the anterior end of the body. These movements were rapid, especially those of the proboscis.

NEMATODES.

4. *Immature nematodes.* [Pl. X, figs. 107–109.] **7**, pp. 280–281.

On many occasions and in different summers I have found immature nematodes encapsuled in the mesentery and on the viscera. They were found in practically all the squeteague (92) examined in the summers of 1899 and 1900. These agree in the main with those found in the blue-fish, scup, and others. The largest specimens measured 17 mm. in length. A rudimentary three-lobed structure of the head could be made out in some by examination under pressure in acetic acid. A diverticulum of the intestine near the base of the œsophagus was observed in several of the specimens. Dimensions of specimen figured in millimeters: Length, 10; diameter, 1 mm. from anterior end 0.24, 1 mm. from posterior end 0.22, maximum (at anterior fourth) 0.3, at anal aperture 0.08; distance of anal aperture from posterior end, 0.12. Length of œsophagus, in a specimen 14 mm. in length, 3 mm.

CESTODES.

5. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in gall bladder and cystic duct. **1**, pp. 453–454, pl. VI, figs. 6–9. **4**, pp. 789–792, pl. LXI, figs. 4–15. **7**, pp. 280–281.

Found almost invariably in fish examined in 1899 and 1900; also free in intestine of squeteague. These are always smaller than those from the cystic duct.

6. *Rhynchobothrium.* Encysted on viscera. **4**, p. 794, pl. LXIV, fig. 1, and p. 798. **7**, pp. 280–281. Usually on the viscera (1899, 1900), associated with immature nematodes and of several species.

7. *Rhynchobothrium speciosum* Linton. Larvæ encysted on viscera. **4**, pp. 801–805, pl. LXIV, figs. 13, 14, and pl. LXVI, figs. 1–7.

8. *Rhynchobothrium bathifer* Linton. Encysted on viscera. See **1** (*R. tenuicolle* Rudolphi), pp. 486–488. **2**, pp. 825–829, pl. X, figs. 8, 9. **4**, p. 793. **5**, p. 448. Aug. 6, 1900.

9. *Tetrarhynchus bisulcatus* Linton. Encysted in stomach wall. **4**, pp. 810–811, pl. LXVI, figs. 11–15. **7**, pp. 280–281. In submucosa of stomachs almost always present (1899 and 1900). [Pl. XXIII, fig. 261, and pl. XXIV, figs. 262–264.]

10. *Tetrarhynchus crinaceus* Beneden. On viscera. **4**, pp. 811–812, pl. LXVII, figs. 1–8. **7**, p. 281.

11. *Syndothrium filicolle* Linton. On viscera. **4**, pp. 815–820, pl. LXVIII, figs. 7–12. Noted in a few cases in 1899.

11*a*. See pl. XX, fig. 230 and description of same, for brief account of a larval cestode from a squid in the stomach of a squeteague. This form is related to the genus *Thysanocephalum*.

TREMATODES.

12. *Distomum appendiculatum* Rudolphi. Intestine. See **7**, p. 289, pl. XXXVI, figs. 25, 26. Found in this host July 25 and Aug. 5, 1899.

13. *Distomum vitellosum* Linton. Intestine. See **7**, p. 290, pl. XXXVII, figs. 38, 39.

Found once in July, 1899, four times in July and August, 1900; rather numerous. The difference in appearance between a specimen in sea water or salt solution and the same specimen in fresh water is very great. See under *Stenotomus*, *Paralichthys*, etc.

14. *Distomum pyriforme* Linton. Intestine. See **7**, p. 290, pl. XXXVIII, figs. 52–59.

Small oval distomes; body covered with minute spines; acetabulum and oral sucker nearly equal; testes median, one behind the other; ova few and large; found twice in 1899 and twice in 1900; appear to belong to this species.

15. *Distomum polyorchis* Stossich. [Pl. XXXIII, figs. 363–365.]

On five occasions in the summer of 1900 distomes were found in the pyloric cæca of the squeteague, which agree very closely with this species. The synopsis of the species given by Stossich is as follows: Body flattened, elliptical, rounded at the extremities. Anteriorly the surface is covered with conical spines set in transverse series. The acetabulum is situated at the anterior third, is somewhat smaller than the oral sucker and prominent. The oral sucker is terminal, globular, and its small aperture circular. It is joined by a slender canal with the pharynx, which is very large and of quadrangular form. There is no œsophagus. Immediately behind the pharynx the intestine divides into two branches which extend to the posterior end of the body; anteriorly, however, each branch is prolonged into a cæcum which extends as far as the anterior border of the pharynx. That which characterizes the species more particularly is the large number of testes. Some of the worms contain 24 placed in two series longitudinally in the middle of the body. The cirrus pouch is club-shaped, large, and forms an arch at the right side of the acetabulum. In it is the seminal vesicle, divided into two unequal parts by a constriction. The vitelline glands occupy all the posterior part and sides of the body and extend laterally as far as the bifurcation of the intestine. They empty into two longitudinal canals which are joined with each other by a transverse median canal, which is provided with a vitelline receptacle of rectangular shape. The oviduct, situated between the acetabulum and the testes, contains minute ova, elliptical and of a yellowish-brown color. The aperture is beside the anterior margin of the acetabulum. Length, 3.5 mm. to 6.5 mm.; breadth, 1 mm. to 1.5 mm. Bull. d. Soc. Adv. d. Sci. Nat. Trieste, vol. VI, 1889, tav. XIV, fig. 61 [p. 2 of extract].

The number of the testes was variable in my specimens. The following numbers were noted. In each case the number in the right row is placed first: 15–15; 15–12; 14–16, two; 14–15, three; 14–13, two; 14–12, two. It is to be understood that each of these testes is either double or two-lobed, a point that will be settled when the specimens are sectioned.[1] The process of egg making was observed in

[1] Sections show that the testes are double; in other words, that they are placed in four instead of two longitudinal series, two dorsal and two ventral; further, that the intestinal rami in the posterior and median portions of the body have numerous short branches.

this species and was essentially like the process observed in *Epibdella bumpusii* (**7**, p. 287). At intervals of about twenty seconds a mass of yolk could be seen to leave the yolk reservoir and proceed the short distance required to reach the definite point in the duct where an active muscular organ molded a shell around the mass. It was then forced forward into the uterus. The lobed ovary, shell gland, yolk reservoir, and beginnings of the uterus are so closely crowded together that further details of the process could not be made out. Length of these specimens (alcoholic) 4 to 7.5 mm.

COPEPODS.

16. Mention may be made also, among entozoan parasites of the squeteague, of a copepod found beneath the skin of the opercular bone, by Mr. E. E. Tyzzer. **7**, p. 285, pl. XXXIII, figs. 1–5.

Sciænops ocellatus, *Red Drum.*

NEMATODES.

1. *Ascaris* sp. [Pl. VIII, figs. 79, 80, and pl. IX, figs. 81–83.]

Collected by S. E. Meek, Fulton Market, New York, from fish taken off Sandy Hook, September 8, 1886. Three males and two females and four small, slender, immature. Habit of body in larger specimens, stout. Dimensions of female in millimeters: Length, 56; diameter of head 0.41, 1 mm. back of head 0.56, maximum 1.8, 1 mm. from posterior tip 0.9, at anal aperture 0.56; distance of anal aperture from posterior end, 0.65; length of œsophagus, 6.5. These dimensions include the loose cuticular membrane. Œsophagus in females somewhat linear-fusiform, with its greatest diameter about its posterior third; in the males somewhat flask-shape, and 2.25 mm. in length in a specimen measuring 20 mm. in length. Largest male, 27 mm. in length. Four postanal and twenty-nine preanal papillæ were counted on the left side, and two postanal and twenty-nine preanal on the right side. Length of spicules about 2 mm.

2. *Ascaris* sp. Immature. [Pl. XII, figs. 134–137.]

Probably young of No. 1, encapsuled in peritoneum. Tail blunt, rounded, with mucronate tip; œsophagus long and linear; intestine dark-brown. Dimensions in millimeters: Length, 16; greatest diameter, 0.43; length of œsophagus, 2.65.

Menticirrus saxatilis, *King-fish.*

FOOD.

Twenty-seven small specimens were examined on five occasions in July and August, 1899, and one large specimen August 3, 1900. July 28, 1899; intestines filled with small amphipods, isopods, and shrimps. August 5, 1899; small crustaceans. August 7, 1899; shrimps, amphipods, isopods, annelids. August 8, 1899; large shrimp with eggs on swimmerets, young fish, and bryozoa. August 28, 1899; annelids. August 3, 1900; pieces of fish, bryozoa.

NEMATODES.

1. *Immature nematodes* (*Ascaris*). [Pl. XIV, figs. 168–171.]

Collected by Vinal N. Edwards, November, 1886. These were very numerous on the stomach and liver; slender, white, smooth, head truncate, tail ending with a mucronate spine. Another lot in U. S. National Museum collection, specimens somewhat larger, rudimentary lips of *Ascaris* discernible and tail not much prolonged beyond anal aperture; mucronate tip to tail not spine-like. These are probably an older stage of the same. The spine-like character of the mucronate tip apparently lost by the shedding of the embryonic investment. Dimensions in millimeters: Length, 21; diameter of head 0.25, middle 0.4, at anal aperture 0.09; distance of anal aperture from posterior end, 0.13. Corresponding dimensions of more mature specimens: 25; 0.24, 0.42, 0.16; 0.16.

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). In intestine. See **1**, p. 289, etc. Found July and Aug., 1899, Aug., 1900. Those obtained on the latter date were very small.

TREMATODES.

3. *Distomum vitellosum* Linton. Intestine. See **7**, p. 290, pl. XXXVII, figs. 38, 39. Found in this host July 28, 1899.
4. *Distomum pyriforme* Linton. Intestine. See **7**, p. 292, pl. XXXVIII, figs. 52–59. Found in this host in August, 1899 and 1900.
5. *Distomum* sp. Intestine. [Pl. XXVIII, fig. 311.]

Two distomes, found July 28, 1899. The following description is based on a memorandum sketch of the living worm and on a mounted specimen. Unfortunately one of the specimens was in bad condition when it was found. Body ovate-elliptical, depressed, with a short, retractile caudal appendix; neck short. Oral sucker subterminal with somewhat triangular aperture, a little broader than long. Pharynx subglobular immediately following the oral sucker. Œsophagus short. Intestinal rami simple elongate, extending to but not entering the appendix. Acetabulum at about the anterior fifth or sixth of the body, a little broader than long, in ventral view, much larger than oral sucker, aperture circular in life, transverse in alcoholic specimen. Cirrus pouch and seminal vesicle behind acetabulum; the cirrus passes to the left of the acetabulum and opens about half way between the suckers on the median line near the œsophagus. Testes two, large, subglobular, placed transversely behind the acetabulum, from which they are separated only by the cirrus pouch and seminal vesicle. Ovary globular, smaller than the testes on median line behind the testes and close to them. Vitelline glands, two slender, convoluted tubular organs marginal to right and left of ovary. No ova were seen in the living specimen and the uterus was not seen.

Dimensions of living specimen slightly compressed, measurements given in millimeters: Length, 3.07; diameter, anterior 0.54, at acetabulum 0.92, median 0.92, near posterior 0.50; oral sucker, length 0.24, breadth 0.24; acetabulum, length 0.41, breadth 0.43; diameter of testis, 0.46; pharynx, length 0.14, breadth 0.14; œsophagus, length 0.07, breadth 0.08.

Dimensions of specimen mounted in balsam, in millimeters: Length, not including appendix, 1.9; length of appendix, 0.32; breadth of body, anterior 0.16, median 0.77, posterior 0.29; of appendix 0.17; oral sucker, length 0.13, breadth 0.14 (in the other (damaged) specimen these dimensions are 0.17 and 0.20); acetabulum, length 0.32, breadth 0.34 (0.45 and 0.41 in the other); pharynx, length 0.08, breadth 0.09 (0.09 and 0.15 in the other).

In the mounted specimen what I take to be an ovum lying dorsal to one of the testes is 0.035 and 0.021 mm. in the two principal diameters.

Tautogolabrus adspersus, *Cuvier, Chapsl.*

FOOD.

Seaweed, hydroid stems, bryozoa, tunicates, annelids, small crustaceans of various kinds (*Caprella*, shrimps, etc.), univalve mollusks found in stomach and intestine—in short, just such food as the fish would get by browsing on the material which grows on wharf piles and similar places.

NEMATODES.

1. *Immature nematodes.* On viscera. Aug. 12, 1900.

CESTODES.

2. *Rhynchobothrium.* Cysts on viscera. **7**, p. 281. Aug. 29, 1899; July 27, 1900.

TREMATODES.

3. *Immature distomes encysted in skin.* **7**, pp. 281, 298, pl. XL, figs. 76–81. Seen frequently in 1899 and 1900. Dr. G. H. Parker reports that a large proportion, out of about 100 cunners collected this summer, are infested with this parasite.
4. *Distomum arcolatum* Rudolphi. Intestine. See **7**, pp. 293–294, pl. XXXIX, figs. 60, 63. Found in this host Aug. 5, 1899.
5. *Distomum vitellosum* Linton. Intestine. See **7**, p. 290, pl. XXXVI, figs. 38, 39. Found in this host Aug. 5, 1899.

Tautoga onitis, *Tautog, Black-fish.*

FOOD.

In specimens examined previous to 1899 the stomachs were empty. In the summers of 1899 and 1900, 24 tautog were examined. In the alimentary canals of the large specimens a great variety of crabs and mollusks were found. A specimen taken at Menemsha Bight, August 1, 1899, had its alimentary canal filled with fragments of crabs and mollusk shells. Among them were recognized *Trittia tricitata* (many), *Purpura lapillus*, *Lunatia heros*, *Acmæa testudinalis*, *Mytilus edulis* (many fragments), *Cancer irroratus*, *Eupagurus pollicaris* (many), *Libinia canaliculata*. The shells and tests had all been more or less crushed and broken. No entozoa were found in the alimentary tract of this fish. Indeed, it is difficult to see how any could stay in a fish which lives on such a mechanically anthelminthic diet. In small specimens were found seaweeds, a variety of small crustacea (amphipods, copepods, shrimps, small crabs, etc.), mollusks, both univalve and bivalve, and annelids.

TREMATODES.

1. *Immature distomes encysted in the skin.*

The entire surface of specimen from Menemsha, mentioned in the food notes given above, was thickly peppered with small black pigment patches, in which small cysts could be seen. These pigment patches and cysts have a general resemblance to those described from the cunner. [**7**, pp. 281, 296, pl. XL, figs. 76–81.] These cysts were so abundant in this specimen that it was a difficult matter to find a scale which was free from them. Usually there was a cluster, often containing as many as 6 or 8 cysts, on each scale. The fins were also thickly beset with them. Even the corneas of the eyes were infested with them; 74 were counted on one eye and 81 on the other; 14 and 17, respectively, were over the pupils. [Pl. XXVIII, fig. 318.] The walls of the cysts were transparent, so that the suckers of the contained distome could be distinguished through them.

Chætodipterus faber, *Moon-fish.*

This fish is rarely taken in the vicinity of Woods Hole. In October, 1886, I received from Mr. S. E. Meek, Fulton Market, New York, a few cysts from the abdominal cavity of a moon-fish from the North Carolina coast, from which the following were obtained.

NEMATODES.

1. *Ichthyonema* sp. From abdominal cavity. [Pl. XVIII, figs. 218, 219.]

The longest entire specimen measured 217 mm. in length; of nearly uniform diameter throughout, maximum diameter 1.6 mm., diameter near anterior end 0.4 mm., increasing soon to 1 mm. In another, a fragment, whose maximum diameter was 1.12 mm., the diameter of the head was 0.23 mm. It was surmounted by four distinct papillæ. The uterus contained ova in various stages of segmentation along with embryos which agree with those described under *Ichthyonema globiceps*. Length, 0.5 mm.; greatest diameter, 0.013 mm. Exceedingly fine-pointed at smaller end. In the larger specimen the principal part of the body, more particularly the anterior half, was literally packed with young.

CESTODES.

2. *Rhynchobothrium speciosum* Linton. Cysts on viscera. **4**, pp. 801–805, pl. LXIV, figs. 13, 14, and pl. LXV, figs. 1–7.
3. *Tetrarhynchus.* Cysts on viscera. **4**, p. 808.

Balistes vetula, *Trigger-fish.*

FOOD.

Twelve small specimens from Katama Bay were examined September 1, 1899. Amphipods, copepods, and seaweed were found in the alimentary canal, but no entozoa.

Alutera schœpfii, *File-fish.*

FOOD.

The stomachs have usually been empty. Two were seen, however, one on July 24, 1887, the other August 5, 1889, in which there were stems of hydroids. In one of these the intestine was filled throughout its length with masses of hydroid stems.

CESTODES.

1. *Dibothrium alutacæ*. Intestine. **1**, pp. 458–459, pl. I, figs. 5–8.
2. *Rhynchobothrium bulbifer* Linton. Cysts on viscera. **4**, p. 793.
3. *Rhynchobothrium*. Cysts in coats of stomach and intestines. **4**, p. 798.

TREMATODES.

4. *Distomum pallens* Rudolphi. Intestine. **6**, pp. 526–527, pl. XLVII, figs. 8, 9.
5. *Distomum valdeinflatum* Stossich. Capsules on peritoneum. **6**, pp. 527–528, pl. XLVII, figs. 10–14, and pl. XLVIII, figs. 1, 2.

Lagocephalus lævigatus, *Smooth Puffer*.

One specimen from Narragansett Bay, July 22, 1887.

NEMATODES.

1. *Immature nematode* (*Ascaris*). [Pl. XI, figs. 121, 122.] From intestine. Dimensions in millimeters: Length, 22; diameter of head 0.1, 1 mm. back of head 0.28, maximum a short distance back of middle 0.48, 1 mm. from posterior end 0.32, at anal aperture 0.12; distance of anus from posterior tip, 0.13; œsophagus short.

CESTODES.

2. *Scolex polymorphus* Dujardin. Abundant, in intestine.

TREMATODES.

3. *Distomum* sp. Intestine. **6**, pp. 537–538, pl. LIII, figs. 1, 2. This specimen bears a close resemblance to *Distomum* sp. from the scup. See No. 11 under *Stenotomus chrysops*.

Spheroides maculatus, *Puffer*.

FOOD.

This species was examined on three occasions in 1899. August 5; 9 small; alimentary canal contained small crabs, amphipods and both lamellibranch and univalve mollusks. August 28; 3 small; hermit crabs and crepidulæ in alimentary canal. August 30; 12 small; crustaceans, small lamellibranch shells, annelids, seaweeds, and sand in alimentary canal. August 28, 1900; 3 small specimens from Katama Bay; shrimps and other small crustaceans in alimentary tract.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Pharynx. **7**, p. 281.

CESTODES.

2. *Tetrarhynchus* sp. Cyst, pharynx. **7**, p. 281.
3. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. See **4**, pp. 789–792, pl. LXI, figs. 4–15. Aug. 5, 1899; 28.

TREMATODES.

4. *Distomum ribex* Linton. Intestine and pharynx. **7**, pp. 281, 291–292, pl. XXXVIII, figs. 48–51. Some small distomes found by Dr. F. P. Gorham in young puffers seem to be the young of this species.
5. *Distomum vitellosum* Linton. Intestine. Aug. 28, 1899. See **7**, p. 290.
6. *Distomum* sp. In cyst, on viscera. This distome was about 0.7 mm. in length and spinose. Probably *D. valdeinflatum*. August 5, 1899.

Chilomycterus schœpfi (*C. geometricus*, *Diodon maculo-striatus*), *Puffer*, *Porcupine-fish*.

NEMATODES.

1. *Ascaris neglecta* Leidy. [Pl. v, figs. 33–36.]

Two specimens from intestine of this fish July 21, 1887, are referred to this species; one male and one female, the latter with the anterior end missing. Leidy's description of this species is: "Body cylindro-fusiform, most narrowed anteriorly; head naked; lips large and obtuse; tail short, conical, acute. Length of female 2 inches, breadth three-fifths of a line; male about half the size." In these specimens the body is transversely wrinkled, producing a beautifully crenulated margin, the crenulations themselves being made finely dentate by transverse lines. Tail mucronate, the tip slightly roughened. No postanal papillæ were made out. There are twenty preanal papillæ, more or less, on each side arranged in a single row; those immediately preceding the anal aperture are the smaller. The papillæ suggest *A. habena*. The length of the fragment of a female was 15 mm., and its diameter 1.3 mm. It exhibited the same crenulate margin with dentate detail of outline as the male.

Dimensions of male in millimeters: Length, 26; diameter of head 0.17, 1 mm. from anterior end 0.21; maximum diameter, near posterior end 0.8, 1 mm. from posterior end 0.62, at anal aperture 0.15; length of head 0.15; distance of anal aperture from posterior end 0.13; length of œsophagus 6.3; length of copulatory spines 4.25, breadth 0.02.

CESTODES.

2. *Ligula chilomycteri*. **4**, pp. 788–789, pl. LXI, fig. 1.

Mola mola (*Mola rotunda*), *Sun-fish*.

FOOD.

I add the following to the meager food notes made in my report for 1898 [**7**, p. 281]: July 19, 1899; 1. Stomach and intestine filled with chyle resembling thick soup or gravy, with remains of salpæ and possibly ctenophores. July 30; 1. The alimentary canal, which in this singular fish is little differentiated into stomach and intestine, and in this individual measured 3.7 meters (12⅓ feet), contained a thickish soup or gravy-like chyle, which in places was held together by a viscid mucus. A large number of salpæ and numerous small, pinkish amphipods were found, the latter more abundant toward the lower part of the intestine. July 10, 1900; 1 (weight, 286 pounds). The alimentary canal contained a yellowish-gray soup-like chyle. Food material not distinguishable. July 29; 1. Taken by the schooner *Grampus* south of Gay Head. A large jelly-fish is reported by Mr. C. W. Stone from the stomach.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi.

A fragment found with a lot of trematodes from the gills, collected by Vinal N. Edwards, July 13, 1881, appears to belong to this species.

NEMATODES.

2. *Immature nematode*. [Pl. VI, figs. 51, 52.]

A small specimen was found encapsuled on the intestine, July 10, 1900.

CESTODES.

3. *Dibothrium microcephalum* Rudolphi. Intestine. **2**, pp. 736–745, pl. II, figs. 5–18. **7**, p. 282.

Thirty-three specimens were obtained July 30, 1899. Twenty of these were normal. In the others the first, and sometimes the second joint also, was elongated and slender. [Pl. XXV, figs. 270, 271.] A similar condition was noted in **2**, pp. 736–737. Thirty-three, also obtained on July 10, 1900, longest 150 cm.; total length of worms about 30 meters (100 feet). July 29, 1900; numerous. Mr. C. W. Stone reports that the harpoon passed through the intestine, and that the tapeworms were in consequence much broken. Only a few were preserved. The largest fragment, which consists of mature proglottides throughout, measures 86 cm. in length and 10 mm. in breadth at widest part. It is 7 mm. wide at anterior end and of nearly uniform breadth, narrowing, however, at posterior end. Another fragment, with scolex attached, which may be a part of the same worm, is 17 cm. in length.

4. *Tetrarhynchus longatus* Wagener. Liver. **1**, pp. 812–813, pl. LXVII, figs. 9–12. **7**, p. 282. July 19, 1899; 5 scolices. July 10, 1900; 6 scolices. July 30, 1899; several. July 29, 1900; several.

One of these larvæ in its blastocyst was dissected out of the liver by Mr. W. W. Francis, July 19, 1899. Its dimensions, in millimeters, follow: Length of anterior actively motile part of blastocyst 18, diameter 4; length of posterior part of blastocyst 400, diameter 2. These dimensions were changed somewhat after the specimen had been lying in water for three or four hours. After killing, the length of the anterior portion was 24 mm. and of the posterior 440 mm., the diameter remaining the same as in the living specimen. The posterior two-thirds was embedded in the liver; the anterior third was on the surface, but under the serous coat. In another specimen the anterior part was 40 mm. in length. The posterior portion was not all dissected out. If the proportions are the same as in the first, it should be 800 mm. in length. The five specimens represent an aggregate length of probably 3 meters, 2 of which are in the substance of the liver. The explanation of the great length which these cestodes attain in the liver of the sun-fish is doubtless to be found in the fact that the life of the host is very long, and therefore the time which the worm is doomed to remain in the liver after it has once gained a lodgment there must likewise be very long. Of course its surroundings must be congenial and conducive to longevity, else its tissues would, sooner or later, degenerate. Although this cestode appears to be invariably present in the liver of the sun-fish, it may be questioned whether the sun-fish is, in a strict sense, the proper intermediate host of this worm. It would indeed be a large animal, and one with phenomenal digestive powers, which would habitually use the sun-fish for food.

5. *Rhynchobothrium* sp. From cysts on intestine under the serous coat. July 7, 1900. [Pl. XXII, figs. 245–250.]

Length of cyst, 27 mm.; breadth, 16 mm. A globular portion of the cyst was of dense connective tissue 5 mm. thick; the space within, about 2 mm. in diameter, was filled with yellowish coagulated fluid. The blastocyst, which had evidently at one time occupied this space but now lay in a thinner walled part of the cyst, was 42 mm. in length and 5 mm. in greatest diameter. It contained a larval *Rhynchobothrium* which, when everted, measured 20 mm. in length.

TREMATODES.

6. *Tristomum molæ* Blanchard. [*Tristomum rudolphianum* Diesing.] Skin, gills. **6**, p. 510. **7**, p. 281.

A sun-fish captured July 30, 1899, was reported by Dr. Dahlgren to have had 138 trematodes on the skin. July 19, 1899; 1. This was translucent, bluish-white, with a shade of pink, especially toward the posterior end. Lateral areas, dark-brown. July 10, 1900; 2.

7. *Distomum macrocotyle* Diesing. Intestine. **6**, pp. 522–523, pl. XLV, figs. 9, 10, and pl. XLVI, figs. 1–5. **7**, p. 282. July 29, 1900; 12.

8. *Distomum contortum* Rudolphi. Intestine. **6**, pp. 528–530, pl. XLVIII, figs. 3–7. July 19, 1899; 3.

9. *Distomum nigroflavum* Rudolphi. Intestine. **6**, pp. 530–531, pl. XLVIII, figs. 8–11, and pl. XLIX, figs. 1, 2. **7**, p. 282. July 30, 1899; 9. July 10, 1900; 2. July 29, 1900; 3.

10. *Distomum foliatum* Linton. Intestine. **6**, pp. 532–534, pl. XLIX, figs. 3–5; pl. L, figs. 1–3; pl. LI, figs. 1–4. **7**, p. 282. July 19, 1899; 1. July 10, 1900; 4. July 29, 1900; 1.

11. *Distomum fragile* Linton. Intestine. **6**, pp. 282–295, pl. XXXIV, figs. 68–70. July 10, 1900; numerous. Length of living specimens, 4.2 mm.

Many copepod parasites were seen on the sun-fish; numerous flat, scale-like forms on the skin; large paired forms on the gills and long lerneans with heads buried in the flesh, the body with eggs hanging like a dark-brown tassel from the skin. One parasitic copepod was found under the skin, which at that point was over an inch thick.

Myxocephalus æneus (*Cottus æneus*, *Acanthocottus æneus*), *Little Sculpin*, *Grubby*.

FOOD.

Annelids, copepods, shrimps, and young fish found in the alimentary canals of young specimens. Many young flounders and shrimps taken from alimentary tracts of young sculpin from Katama Bay, August 28, 1900.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. **3**, p. 525.

NEMATODES.

2. *Immature nematodes* (*Ascaris*). **7**, p. 282.

Two lots of these specimens, collected by Vinal N. Edwards November 5, 1886, and October 24, 1887, are in the U. S. National Museum collection. They are of nearly uniform diameter, but taper a little more anteriorly than posteriorly; the largest are 22 mm. in length and 0.5 mm. in greatest diameter. They agree with immature ascarids from *Prionotus carolinus*.

2*a*. *Ascaris* sp. [Pl. VIII, figs. 70–72.]

Specimen, a female, collected by S. E. Meek, Fulton Market, New York, October 28, 1886. Dimensions in millimeters: Length, 50; diameter, head 0.26, maximum (posterior third) 1.75, 1 mm. from head 0.26, 1 mm. from posterior end 0.9, at anal aperture 0.32; distance of anal aperture from posterior end, 0.4.

CESTODES.

3. *A larval cestode*, probably *Dibothrium* sp. On viscera.

Small, somewhat flask-shape, with pore at anterior end. July 27, 1900.

4. *Rhynchobothrium* sp. Cysts in muscles. **4**, p. 798.

TREMATODES.

5. *Distomum appendiculatum* Rudolphi. Intestine. July 27, 1900. See **7**, p. 289, pl. XXXVI, figs. 25, 26.

Dimensions in millimeters (alcoholic specimens): Length, 2.10; diameter oral sucker 0.065, of acetabulum 0.148; ova, 0.024 and 0.010 in the principal diameters.

Cottunculus thomsonii.

NEMATODES.

1. *Ascaris* sp. [Pl. IX, figs. 84–87.]

Fourteen specimens from stomach of fish taken by steamer *Albatross*, station 2739, 1887; depth, 811 fathoms. Body thickened posteriorly, attenuate anteriorly, most rapidly for first 5 mm., crossed by minute transverse striæ, which are 0.025 mm. apart. Length of lips about equaling diameter of head; lateral lips each with a single papilla near front edge; anterolateral edges prominent and rounded; lateral membrane of lip narrow; triangular interlip large; lips unsymmetrical. Posterior end of body curved in males, straight in females. The largest specimen measured 97 mm. in length and 1.5 mm. in diameter. Dimensions of another specimen, a female, in millimeters: Length, 84; diameter of head 0.2, near middle 1.25, 10 mm. from posterior end 1.3, at anal aperture 0.5; length of lips, 0.2; distance of anal aperture from posterior end, 0.8 The larger males nearly equal the larger females. Two postanal papillæ were made out in side view of larger specimens. In a smaller specimen, 28 mm. in length, 3 postanal on each side and 17 preanal on one side and 19 on the other were seen. These were arranged in a single row on each side. Spines slender and sharp-pointed; length, 2 mm.; diameter, 0.02 mm.

Hemitripterus americanus, *Sea Raven*, *Red Sculpin*.

NEMATODES.

1. *Ascaris* sp. [Pl. IX, figs. 91–94, and pl. XIII, figs. 157–159.]

U. S. National Museum collection; collected by Vinal N. Edwards, November 5, 1886. These worms are of nearly uniform diameter throughout, a little thickened posteriorly, the tail recurved. Narrow alæ were observed near the head of one, a female; body smooth. A male, 40 mm. in length, diameter of head 0.23 mm. and of body 0.7 mm., and length of spines about 0.3 mm., had about twenty preanal papillæ on one side. These appeared to lie in a single row, the posterior ones being close together and small, the anterior ones more sparsely distributed and larger; postanal region short.

Another lot, collected also by Mr. Edwards, October 12, 1887, appear to be immature females of the same species. The embryonic cuticle was still adherent to the posterior end of one. The alæ back of the head were more distinct and the postanal region rather more elongated. Dimensions in millimeters: Length, 20; diameter of head 0.25, middle 0.6, at anal aperture 0.23; distance anal aperture from posterior tip, 0.34.

Several other lots, most of them collected by Mr. Edwards, consist of immature nematodes encapsuled on viscera. They are young ascarids, and while their relative proportions differ considerably from the larger specimens they are, without much doubt, younger forms of the same species. Dimensions of a typical specimen in millimeters: Length, 15; diameter of head 0.08, middle 0.31, at anal aperture 0.12; distance of anal aperture from posterior tip, 0.21. [Figs. 157–159.] See under *Glyptocephalus cynoglossus*.

TREMATODES.

2. *Distomum simplex* (?) Rudolphi. Intestine. **6**, pp. 525–526, pl. XLVII, figs. 3–7.

Opsanus tau (*Batrachus tau*), *Toad-fish*.

FOOD.

Among my food notes of this species I find the following noted: *Littorina littorea*, *Ilyanassa obsoleta*, *Trittia trivittata*, *Urosalpynx cinerea*, usually with hermit crabs; *Crepidula fornicata*, *Pecten irradians*, *Cancer irroratus*, *Palæmonetes vulgaris*, *Eupagurus longicarpus;* bones and other fragments of fish; a partly digested toad-fish. I have seen a toad-fish in the aquarium in the act of swallowing another of its own species but little smaller than itself. In the alimentary canal of a small specimen two shells of *Utricalus canaliculatus* (Bulla) were found.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. Oct. 22, 1887. Collected by Vinal N. Edwards. Length, 22 mm. See **3**, p. 525; **1**, p. 492.
2. *Echinorhynchus agilis* Rudolphi.
   In the U. S. Nat. Mus. collection; a single specimen, collected at Woods Hole. Length, 4 mm.
3. *Echinorhynchus fusiformis* Zeder (?). [Pl. II, fig. 11.] Intestine.
   One specimen, a male, collected August 7, 1899. This appears to be near *E. fusiformis* Zeder. The body is fusiform, gradually attenuate in front to the base of the proboscis, abruptly constricted at testes, whence it is cylindrical to the posterior end. Proboscis clavate; eight vertical rows of hooks visible on a side and about fifteen hooks in a vertical row. The hooks are sharp, recurved, and rather slender. Testes two, elongated, lying end to end, and are followed by an elongated, tubular, seminal receptacle and a subglobular bulbus ejaculatorius (?), which communicates with the copulatory bursa by a slender duct.
   Dimensions of a mounted specimen, from which this description was written, in millimeters: Length, 5; length of proboscis 0.66, of proboscis sheath 0.73, of lemnisci 1; diameter of proboscis, apex 0.15, middle 0.13, base 0.10; diameter of body, anterior 0.15, middle 0.48, posterior 0.13.

NEMATODES.

4. *Ascaris labiata* Linton. Stomach and intestine. **7**, pp. 282, 302–303, pl. XLIII, figs. 109–115.
   Found five times in the summer of 1899 and four times in the summer of 1900. It was found in every lot of toad-fish examined, although not in every individual. The eggs of this species are large and rather transparent. [Pl. VI, figs. 56 *a–i*.] The number of chromosomes appears to be small. A sketch of a young specimen with embryonic cuticle is shown in pl. VI, fig. 55.

CESTODES.

5. *Rhynchobothrium tumidulum* Linton. Scolices in intestine. See **2**, pp. 829–832, pl. XI, figs. 3–11. July 26, 1900; 1. Aug. 10, 1900; numerous.
   These scolices are characterized by having a conspicuous red pigment blotch in the neck. Others with essentially the same kind of proboscides, but with no red pigment, were found August 5, 1899. The hooks and proboscides resemble *R. tumidulum*. [Pl. XXI, fig. 241.]

TREMATODES.

6. *Distomum tenue* Linton. Intestine. See **6**, pp. 535–536, pl. LII, 2–8. Aug. 15, 1899; July 26, 1900; Aug. 4 and 10, 1900; few. Color in life translucent bluish-white, vitellaria yellowish-green.

A small globular cyst, yellowish, in one lot, from the viscera and several others from cysts in the liver in another lot contained minute distomes, which are probably young of this species. There was a double row of spines around the mouth, about 25 in each row.

7. *Distomes* (undetermined species). [Pl. XXIX, figs. 324–329.] Intestine.

On August 15, 1899, a small lot of distomes were obtained in which there are at least two distinct species. On account of the small number and the unsatisfactory condition of the preserved material I shall not assign specific names to them. They were associated with specimens of *D. tenue* and *D. tornatum*.

A. (Figs. 324, 326.) One larger and one smaller specimen. The living worms were yellowish. Body oblong, appressed, transversely rugose, with minute scattering scale-like spines (easily overlooked). Oral sucker and acetabulum about equal. Aperture of mouth in smaller specimen with notch at anterior border (not noted in larger specimen); aperture of acetabulum a little wider than long. Pharynx longer than broad, apparently protruding into the oral sucker. Œsophagus, if any, short; intestinal rami simple, extending nearly to the posterior end. Testes two on median line about middle of body, the anterior testis subglobular, the posterior somewhat three-lobed. Seminal vesicle (made out only in smaller specimen) dorsal to acetabulum; genital aperture on median line immediately in front of acetabulum; ovary near posterior border of acetabulum, a little to left of median line; a seminal receptacle was made out in the smaller specimen anterior to the ovary, and to the left; vitellaria voluminous in posterior and lateral regions of body and extending at least as far forward as the acetabulum, in the smaller specimen as far as the pharynx. Ovum, in larger specimen only, 0.10 and 0.07 in the two principal diameters.

The following table shows the dimensions in millimeters, the larger specimen in turpentine, the smaller in balsam:

	Larger specimen.	Smaller specimen.
	mm.	*mm.*
Length	3.60	1.10
Greatest diameter	.80	.37
Length of anterior sucker	.36	.17
Breadth of anterior sucker	.38	.18
Length of acetabulum	.38	.17
Breadth of acetabulum	.42	.21
Length of pharynx		.08
Breadth of pharynx		.11

B. Two specimens stained and mounted in balsam. These agree in the relative proportions of suckers and pharynx, in the position of the genital aperture, and the general arrangement of testes and ovary. The greatest difference is in the character of the vitellaria; other differences may be accounted for by different conditions of contraction.

Characters common to both are: Acetabulum much larger than oral sucker, broader than long; oral sucker longer than broad; pharynx nearly as large as oral sucker; œsophagus short; intestinal rami simple, reaching nearly to posterior end; testes two on median line in about the posterior third of body, the anterior testis immediately preceded by the ovary, which lies a little to the right of the median line; genital aperture a short distance in front of acetabulum, to the left of the median line; the radiating muscles of the cirrus bulb are distinctly seen in ventral view upon focusing with a high power.

a. (Fig. 327.) This specimen was probably killed while flattened out under pressure. The body is smooth, the intestinal rami thin-walled and inflated. There is a vitelline reservoir immediately in front of the ovary, into which two anterior and two posterior vitelline ducts empty. The vitellaria are rather irregular small granular masses at the posterior end of the body and along the lateral margins nearly to the acetabulum. The two testes and ovary are each subglobular.

b. (Figs. 328, 329.) This specimen is much contracted. The body is transversely rugose, and the posterior region, when strongly magnified, is seen to be beset with minute, bristle-like spines. The intestinal rami are slender, but thick-walled. The vitellaria are at the posterior end of the body and along the margins as far forward as the pharynx; the granular masses larger and more crowded than in *a*. Testes and ovary broader than long.

Dimensions in millimeters:

	a.	*b.*
	mm.	*mm.*
Length	1.21	0.88
Maximum diameter	.43	.45
Length of oral sucker	.16	.16
Breadth of oral sucker	.11	.13
Length of acetabulum	.17	[illegible]
Breadth of acetabulum	.23	[illegible]
Length of pharynx	.11	[illegible]
Breadth of pharynx	.10	[illegible]
Longer diameter of ovum	[illegible]	[illegible]
Shorter diameter of ovum	[illegible]	[illegible]

8. *Monostomum vinal-edwardsii* sp. nov. [Pl. XXXIV, figs. 373–376.] Aug. 5, 1899; 7. July 26, 1900; Aug. 4 and 10, 1900; numerous. Young and adult together in same lot.

The following preliminary synopsis of these interesting trematodes is here given: Body thickish, depressed, slightly convex above, flat below, outline varying but approximating ovate, covered with exceedingly minute villous spines. Oral sucker circular, subterminal, aperture nearly circular. Pharynx varying in preserved specimens, subglobular in life near oral sucker, but in favorable positions seem to be separated by a short canal. Œsophagus short; intestinal rami two, simple, extending to posterior end of body. Testes in the larger specimens apparently eight, four on each posterolateral margin (in one specimen there were five on the right side and four on the left). In smaller specimens the testes are in two lateral clusters of four or five or more testicules each, situated at about the posterior third, which in such specimens is usually the widest part of the body. Seminal vesicle on median line, curving to the left, the cirrus opening by an acetabuliform aperture about the anterior third. The vitellaria are dendritic organs, distributed generally in the posterior part of the body behind the genital acetabulum in younger specimens, confined to the lateral regions of the middle third of the body of older specimens. Ovary a many-lobed organ on the median line a short distance behind the genital acetabulum, from which it is separated by the seminal receptacle and base of the cirrus pouch. Excretory vessels very numerous in the anterior third of the body, each opening independently on the surface. Uterus very voluminous, in the older specimens filling up all the posteromedian part of the body. Ova rather small and elliptical. Dimensions of a living specimen slightly compressed, in millimeters: Length, 2.36; diameter of oral sucker 0.25, of pharynx 0.15, of genital acetabulum 0.13; ova, 0.021 and 0.010 in the two principal diameters. At certain ages there is a very characteristic coloration in these worms, due to the different ages of the ova. The beginning folds of the uterus on the left side are opaque white; the next, toward the posterior and on the right side, are light yellow, shading into amber and smoky brown, becoming much darker toward the anterior.

The external opening of the uterus was not made out, although a minute aperture was noted in one specimen which had lain over night in salt solution 0.07 mm. in front of the genital acetabulum. This point will doubtless be settled when the specimens are sectioned.

Prionotus carolinus, *Sea Robin.*

FOOD.

Stomachs and intestines of this species have yielded a variety of material. In one specimen were found a young herring, several young clams (*Mya*), two shrimp (*Palæmonetes*), and a pebble. Small specimens have yielded shrimps in large numbers, amphipods and other small crustaceans, squid and lamellibranch mollusks, annelids, and seaweed. One small specimen had four young winter flounders in its stomach

NEMATODES.

1. *Immature nematodes.* On serous covering of viscera. Aug. 21, 1899; Aug. 21, 1900; few.

Some immature ascarids collected July 21, 1887, encapsuled in peritoneum. Dimensions in millimeters: Length, 20; diameter of head 0.11, 1 mm. from anterior 0.27, maximum 0.56, 1 mm. from

posterior end 0.35, at anal aperture 0.13; distance of anal aperture to posterior end, 0.25. Intestinal diverticulum noted at base of œsophagus in smaller specimens.

CESTODES.

2. *Rhynchobothrium.* Encysted on viscera. **4**, p. 795, pl. LXIII, figs. 3–5. **7**, p. 282.
3. *Tetrarhynchus bisulcatus* Linton. Encysted in stomach and intestine. **7**, p. 282.

TREMATODES.

4. *Distomum appendiculatum* Rudolphi. Intestine. See **7**, p. 289, pl. XXXVI, figs. 25, 26. Found in this host Aug. 5, 1899, and Aug. 10, 1900.
5. *Distomum* sp. Intestine. **7**, p. 295, pl. XXXIX, fig. 71. Probably the species called by me *D. vitellosum*. See under *Clupea harengus*, *Stenotomus chrysops*, etc.
6. *Diplostomum* sp. Intestine. One small specimen found Aug. 30, 1899.

Lopholatilus chamæleonticeps, *Tile-fish.*

FOOD.

Viscera of a number of tile-fish taken July 29, 1899, and placed in formalin were looked over and the following food notes made: Crabs in large numbers, the intestines of some of the fish being filled with them. A part of a squid was found in one, and in the stomach of another were two spiny dog-fish (*Squalus acanthias*). In others, taken August 10, 1899, 80 miles south of Gay Head, were found many crabs, a bivalve mollusk (*Yoldia*), tests of large salpa, an eel, and bones of fish. The following list was made out from the contents of the alimentary canals of 18 specimens taken July 30, 1900, south of Marthas Vineyard in 65 to 110 fathoms: Pieces of menhaden (bait) in stomachs of three or four; intestines, particularly the lower parts, filled with fragments of crustaceans, in which a few mollusk shells, salpæ, annelids, a holothurian, actinians, and fish bones were found.

For assistance in the following partial identification of this material I am indebted to Mr. Freeland Howe: *Munidia caribæa* (very abundant), eupagurids (abundant), brachyurans (abundant), spider crabs, small (many), *Nepturus*, *Yoldia* (few), *Cardium?* (fragment of valve), nereis-like annelid (one and fragment), sandy worm-tube (one), *Adamsia sociabilis* (abundant), *Thyone* sp. (one, identified by Dr. H. C. Clark), tunics of *Salpa zonaria-cordiformis* (numerous), fish bones (otic bones, vertebræ, lenses, etc., numerous).

The tile-fish is preeminently a crab-eater. On account of the nature of its diet, which must be a very trying one on any entozoan which attempts to maintain a position in the alimentary tract, not many entozoa are to be expected in the tile-fish, and few are found.

ACANTHOCEPHALA.

1. *Echinorhynchus.* Representatives of this genus found on two occasions.

a. July 29, 1899. An immature specimen from a cyst in the stomach wall. [Pl. II, figs. 6, 7.] Only the anterior end could be found when the specimen was mounted. The proboscis is only partly everted and its basal portion is retracted for a short distance by the inversion of the anterior end of the body; so far as it can be seen, the proboscis is clavate, though it is probably fusiform when fully everted. The hooks are prominent; those in about the first four basal rows are arcuate, slender, others recurved, all rather large; sheath thickest in middle, tapering toward its posterior end; lemnisci slender, a little longer than sheath. Dimensions of specimen mounted in balsam, in millimeters: Diameter of base of proboscis (a part of the base is concealed), exclusive of hooks 0.33, including hooks 0.44; diameter of apex of part extended, excluding hooks 0.36, including hooks 0.5; length of part of proboscis everted, 0.36; length of entire proboscis (estimated), 0.857; length of longest hooks, 0.09; length of sheath, 0.87; diameter of sheath, anterior 0.36, middle 0.4, posterior 0.26; lemnisci extend about 0.07 beyond sheath and are about 0.045 in diameter.

b. July 30, 1900. [Pl. II, figs. 8–10.] A small female from the intestine. Body nearly linear, tapering very gradually toward the bluntly rounded posterior end. Proboscis erect, cylindrical, with numerous hooks placed very close together so that point of one hook overlaps the base of the succeeding hook. Hooks in one or two of the basal circles slender and arcuate, others stout and abruptly recurved;

about 14 rows of hooks visible counted transversely, and about 16 counted from base to apex. The sheath is cylindrical and the lemnisci appear to be a little shorter than the sheath. Dimensions of alcoholic specimen, in millimeters: Length, 10; length of proboscis, 0.72; diameter of proboscis, base 0.34, middle 0.33, apex 0.28; length of longest hooks, 0.06; length of sheath, 1.16; diameter of sheath, 0.32; diameter of body, anterior 0.58, near posterior 0.43.

NEMATODES.

2. *Immature nematodes.* [Pl. XI, figs. 123, 124.] Encapsuled and free.

Found on each occasion on which this fish was examined. On July 30, 1900, rather numerous. The worms were still living when they were examined and appeared to be identical with immature nematodes from *Urophycis chuss* and *Paralichthys oblongus*, with which they were compared. Figs. 123 and 124 are from sketches of a specimen collected by the Fish Commission in 1881. Length, 15 mm.

CESTODES.

3. *Larval cestodes (Scolex polymorphus* Dujardin). Free in intestine. See **4**, p. 789, etc.

Noticed in material collected August 10, 1899; rather numerous in material collected July 30, 1900. The latter were still active, the viscera from which they were obtained having been kept on ice for two days. They appear to be similar to forms found in the squeteague and other fish, although doubtless many species are represented by this well-named *Scolex polymorphus*. Red pigment patches were noted in the necks of these larvæ.

4. *Tænia-like fragments.* Intestine. **7**, p. 282.

5. *Cestode;* new. Intestine. [Pl. XX, figs. 233, 234, and pl. XXI, figs. 236–238.]

Two scolices, which appear to belong to an undescribed genus, were obtained from the intestine of a tile-fish July 29, 1899. The specimens had been in formalin for two days before I had an opportunity of seeing them. The heads and posterior parts were white, the neck and median parts pinkish. They were about 6 mm. and 8 mm. long, respectively. The scolex resembles *Echeneibothrium* in having four unarmed bothria and a terminal muscular disk which is provided with an anterior central auxiliary sucker. Each bothrium, considered alone, suggests the genus *Phyllobothrium*, being without transverse costæ, having the borders thrown into crumpled folds and being provided with an auxiliary acetabulum on its anterior border. The bothria seem to be placed on the head, as in *Crossobothrium*, while they project in the preserved specimens so as to stand nearly perpendicular to the flat surface of the neck, as in *Calyptrobothrium*. The muscular disk in front of the bothria suggests the genera *Tylocephalum* and *Discocephalum*, while the terminal auxiliary acetabulum, which can be seen in the mounted specimen and has its presence fully demonstrated in longitudinal sections, finds its counterpart in the genus *Echeneibothrium*. The auxiliary acetabula on the bothria are concealed by the anterior muscular disk and are difficult to see in these specimens. Transverse sections of the body show no rudiment of reproductive organs, no differentiation of a central core, only a few comparatively coarse longitudinal muscles in the parenchyma.

The vessels of the water-vascular system are prominent and tortuous, and may be seen along the lateral margins of the body, the margins of the bothria, and extending into the muscular disk. Other dimensions in millimeters are: Breadth of disk between bothria 1.16, thickness 0.93; thickness of head through bothria, 1.31; transverse diameter of head, 1.74; diameter of anterior acetabulum, 0.15; breadth of body back of head 1.09, thickness 0.6.

6. *Tetrarhynchus bisulcatus* Linton. Scolex. July 30, 1900.

This specimen agrees with *T. bisulcatus*, except that the collar is wider than the head, and rugose.

TREMATODES.

7. *Distomum ovocaudum* Molin. Intestine.

Twelve specimens obtained August 10, 1899, agree with the species which I have been recording under this name. Length of specimens mounted in balsam vary from 1 mm. to 2.5 mm. See **6**, pp. 514–515, pl. XLII, fig 13. **7**, p. 288, pl. XXXV, figs. 16–24.

8. *Distomum facundum* Linton. Intestine. **7**, pp. 282, 289–290, pl. XXXVI, figs. 27–35, and pl. XXXVII, figs. 36, 37.

July 30, 1900; 1, which is probably to be referred to this species. The material from the intestine was washed out in fresh water. Some distomes swell up when placed in fresh water, the acetabulum

becomes prominent, and the general appearance becomes much altered. While this specimen differs considerably in its outlines from the one figured in the original description, the difference is not so great as I have seen in other species, due to difference in treatment.

Remora remora (*Echeneis remora*), *Remora, Sucker.*

FOOD.

Of the nine remoras examined the stomachs were empty in all but two; one of these contained the bones and tail of a fish resembling the menhaden; the other contained a squid.

CESTODES.

1. *Rhynchobothrium speciosum* Linton. Cysts on viscera. **1**, pp. 801–805, pl. LXIV, figs. 13, 14; and pl. LXV, figs. 1–7.

TREMATODES.

2. *Distomum lageniforme* Linton. Intestine. **6**, pp. 524–525, pl. XLVII, figs. 1, 2.
3. *Distomum monticellii* Linton. Intestine. **6**, pp. 518–520, pl. XLIV, figs. 2–8. Aug. 17, 1899; 4. Aug. 9, 1900; 7. On gills.

The preserved specimens of these two lots measure from 4 to 5 mm. in length. While living they vary, with different stages of contraction, between 4 mm. and 10 mm. In the living worm the body was transparent, slightly tinged with yellow; folds of uterus orange, lighter in posterior part of body; suckers also transparent tinged with yellow; testes, seminal vesicle, and cirrus pouch white.

Merluccius bilinearis, *Silver Hake, Whiting, Frost-fish.*

FOOD.

Stomachs empty in most of the specimens which have been examined. The following have been noted: Fragments of fish on two occasions; small crustacea in intestine of one; many crabs (*Panopeus*) in stomach and intestine of one.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. One specimen, a female, July 11, 1900.

This specimen was smaller and more slender than the worms from the winter flounder and others which I have referred to this species. The proboscis is cylindrical; hooks very regularly placed, twelve in each of the eight vertical rows which are visible on one side. See **3**, p. 525, etc.

NEMATODES.

2. *Immature nematodes* (*Ascaris*). [Pl. XIII, figs. 160–162.] Serous coat of viscera. **7**, p. 282.

Found in the specimens examined in the summers of 1899 and 1900. Some of those found in 1900, which were particularly abundant on the pylorić cæca, can be recognized as young of the genus *Ascaris*. These were reddish or reddish-brown and from 5 to 16 mm. in length. Collected also by S. E. Meek, Fulton Market, New York, November, 1886. "Abdominal cavity appeared swarming with the worms. All were very lively." Dimensions of one in millimeters: Length, 22; diameter, 0.43; length of œsophagus, 2.6. Figs. 160, 161, are from the latter.

CESTODES.

3. *Dibothrium crassiceps* Rudolphi. Intestine. [Pl. XXIV, figs. 266–268.] Aug. 5, 1899; 1. Scolex and short strobile.

Length, 8 mm. (alcoholic); number of joints, about 40. Dimensions in millimeters, life: Length of head, marginal view, 1; length of bothrium, lateral view—i. e., corresponding to the flat surface of the body 1.14; breadth of head, corresponding to marginal view of body 1.5, corresponding to flat surface of body 1.3; breadth of first segment, anterior 0.78, posterior 1.07, thickness 0.36. Posterior segments show rudiments only of the reproductive organs, but no indication of external genital opening. The cuticle is covered with minute spines. In the alcoholic specimen the head is nearly spherical. See No. 6, under *Pomatomus saltatrix*.

4. *Dibothrium angustatum* Rudolphi. Intestine. [Pl. XXIV, figs. 269, *a*, *b*, *c*.]

Thirty-seven young strobiles, August 21, 1899. These agree closely with Diesing's synopsis of this species: "Head elongate, tetragonal, slender, with oblong lateral bothria; neck very short. First segments elongated, very narrow; succeeding segments shorter, subquadrate."

The outline of the head varies with the state of contraction, but the prevailing form is linear-oblong or somewhat clavate. Segments slender, almost cylindrical, slightly enlarged at their posterior ends. Dimensions of an alcoholic specimen in millimeters: Length of head, 1.16; breadth, anterior 0.33, greatest breadth 0.33, posterior 0.19. Another: Length of head, 1.21; breadth, anterior 0.22, greatest breadth 0.26, posterior 0.17. Longest head measured 1.92 mm. in length to the first distinct segment. The strobiles are linear or nearly so and measured about 25 mm. in length.

5. *Phyllobothrium* sp. Immature. Intestine. [Pl. XX, figs. 231, 232.]

Three specimens collected July 11, 1900, bear some resemblance to larvæ which are not infrequent in the common squid. (**4**, p. 792, pl. LXII, figs. 1–9.) Head white, with four bothria, which have crumpled borders and an auxiliary acetabulum on anterior border of each. There is also a muscular sucker (myzorhynchus) on anterior part of head between the bothria. Neck linear, ligulate, translucent, the vessels of water vascular system showing plainly as sinuous lateral lines, in preserved specimens, filiform. Body fusiform, appressed, opaque, pinkish. The largest specimen measured in life 44 mm. in length. Length of head, 3 mm.; of head and neck, 26 mm.; of body, 18 mm.

6. *Rhynchobothrium* sp. Encysted on viscera, especially on pyloric cæca. **7**, p. 282. Found also in 1899 and 1900.

Immense numbers of small pyriform cysts, 2 to 5 mm. long, were found on pyloric cæca of a silver hake, July 11, 1900. Dimensions of one of these larvæ in millimeters: Length, 3; length of head, 0.87; of contractile bulbs, 1.02; of proboscides, estimated, 1.74; diameter of proboscis, inc\ading hooks, 0.15; length of longer hooks, 0.07; diameter of contractile bulbs, 0.12. The hooks differ from any I have yet seen, bearing some resemblance to those of *Tetrarhynchus crinaceus*. [Pl. XXII, figs. 251–254.]

7. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. **7**, p. 282. See **4**, p. 789, etc. Found also in 1899 and 1900.

TREMATODES.

8. *Distomum cercatum* Molin. Intestine. See **4**, p. 514, etc. **7**, pp. 282, 288, pl. XXXV, figs. 16–24. Found also Aug. 21, 1899; 10.

9. *Distomum vitellosum* Linton. Intestine. **7**, pp. 282, 290. Found Aug. 21, 1899; 18. [Pl. XXX, fig. 335.]

Pollachius virens, *Pollock.*

NEMATODES.

1. *Ascaris clavata* Rudolphi. Stomach. **7**, pp. 283, 302, pl. XLIII, figs. 105–108.

In the U. S. National Museum collection there are three specimens from the pollock which evidently belong to this species. While they, together with those from the cod, present many variations, they agree in having the posterior end truncated and the upper lip oblong with a somewhat cylindrical pulp. The side membranes were not easily seen in all. The adults of both sexes are more attenuate anteriorly than posteriorly, while the males are shorter and relatively stouter than the females. See under *Gadus callarias*, No. 2.

1*a*. *Immature nematodes.*

Six lots in U. S. National Museum collection from body cavity. Specimens inclosed in embryonic cuticle. Length about 24 mm., head truncate, tail with mucronate tip. Collected in October and November, 1886.

CESTODES.

2. *Rhynchobothrium.* Larvæ encysted on mesentery. **7**, p. 283.

TREMATODES.

3. *Dactylocotyle denticulatum* Olsson. [*Octobothrium denticulatum* Olsson.] Gills. **7**, pp. 283, 286, pl. XXXIII, figs. 6–10.

1. *Distomum cercatum* Molin. Stomach. **7**, pp. 283, 288, pl. XXXV, figs. 16–24. See **6**, pp. 514–515, pl. XLII, fig. 13.

Microgadus tomcod, *Tomcod.*

FOOD.

Annelids, shrimp, amphipods, and other small crustaceans found in the alimentary canals.

NEMATODES.

1. *Ascaris* sp. [Pl. IX, figs. 97–99.] Immature. Intestine. Found in July 1886, Aug. 1887, and 1899; few. In intestine near pyloric cæca; length, 25 to 35 mm; probably the young of *Ascaris clavata.*

CESTODES.

2. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. Aug. 2, 1900. See **4**, p. 789, etc.
3. *Rhynchobothrium imparispine* Linton. Encysted on viscera. **4**, pp. 799–801, pl. LXIV, figs. 9–12.
4. *Rhynchobothrium* sp. Encysted, submucosa of intestine and peritoneum. **4**, p. 794, pl. LXIII, fig. 2.

TREMATODES.

5. *Distomum appendiculatum* Rudolphi. Intestine. Aug. 2, 1900. See **7**, p. 289, pl. XXXVI, figs. 25, 26.
6. *Distomum simplex* Rudolphi. Intestine. [Pl. XXX, figs. 331, 332.] **6**, pp. 525–526, pl. XLVII, figs. 6, 7. Aug. 13, 1900; 3.

These distomes when first seen were yellowish white, nearly transparent, the surface corrugated by fine transverse lines. They then resembled very closely the small distomes (No. 19 under P. *dentatus* [fig. 336]) from the flounder collected August 17, 1899. When a specimen, which was quite short and corrugated and kept under slight pressure, was held over the flame of an alcohol lamp and warmed sufficiently to stiffen it, the body relaxed and became much elongated. After seeing the diverse shapes which distomes of the same species assume under different conditions of development and contraction one realizes the inadvisability of bestowing specific names on new forms in the absence of a good number of specimens. These specimens varied from 1.22 mm. to 2.47 mm. in length. A few dimensions of a specimen in glycerine given in millimeters are: Length, 2.40; breadth, 0.44; oral sucker, length 0.19, breadth 0.17; diameter of pharynx, 0.09; acetabulum, length 0.25, breadth 0.29; ova, 0.08 and 0.04 in the two principal diameters.

Gadus callarias (*Gadus morrhua*), *Cod.*

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi.

Eleven lots in the National Museum collection from Woods Hole, collected in November and December, 1887; two in January, 1888, by Mr. Vinal N. Edwards; one collected August 22, 1883, and one from Eastport, Me. (Palmer, collector). Three of these lots contain very numerous specimens; the others range from 1 to 54. These specimens from the cod, while showing considerable variety in shape and size, agree closely in the maximum and minimum dimensions. The females in nearly every lot measure from 28 mm. to 30 mm. in length, and the males from 6 mm. to 8 mm.

NEMATODES.

2. *Ascaris clavata* Rudolphi. Stomach.

Eleven lots of nematodes from this host, seven collected at Woods Hole, by Vinal N. Edwards, in November, December, 1887, and January, 1888; one lot collected by Mr. Thomas Lee on the steamer *Albatross*, August 22, 1883; one from a salt cod, collected by Mr. A. H. Clark; one from Long Island, collected by Mr. S. E. Meek, and one from Casco Bay, while presenting many individual variations, appear to belong to this species. The specimens in these lots vary from 6 mm. to 62 mm. in length. The smaller are relatively more slender than the larger ones, which were considerably thickened posteriorly.

Dimensions of two specimens, in millimeters: Length, male 30, female 48; diameter of head, male 0.28, female 0.30; diameter 2 mm. back of head, male 0.80, female 0.70; diameter middle, male 0.85, female 1.10; diameter 2 mm. from posterior end, male 0.80, female 1; diameter at anal aperture, male 0.25, female 0.35; distance of anal aperture from posterior end, male 0.15, female 0.28.

The adults of both sexes are more attenuate anteriorly than posteriorly, while the males are shorter and relatively stouter than the females. In the female from which the measurements given above were taken the upper lip was unsymmetrical, oblong, length 0.2 mm. and breadth 0.22 mm. The tip of the tail usually mucronate and minutely roughened or beset with short spicules. The majority of specimens in these lots were immature, and but few males were noticed. The anal papillæ were but imperfectly made out; no postanal papillæ were noted in males examined; 23 or 24 preanal papillæ on a side were counted, the posterior 8 or 10 small, pedicelled, and capitate. The remainder, including a pair immediately in front of the anal aperture near the median line, are larger and not capitate. The number appears to be the same on each side.

The smaller specimens were smooth; the larger often transversely rugose, especially toward the posterior end. The lateral alæ appear to be an adult character. See under *Pollachius virens*, No. 1 and **7**, pp. 283, 302, pl. XXXVIII, figs. 105–108.

3. *Immature nematodes* (*Ascaris*). Serous covering of stomach, intestine, liver, etc.

I have examined nine lots of nematodes which came from capsules in various parts of the body cavity of the cod. The greater part of these were collected by Mr. Vinal N. Edwards in the months of November and December, 1887. These specimens for the most part agree with descriptions of *Ascaris capsularia;* that is to say, they are immature ascarids. Specimens were found, however, which were sufficiently developed to make it appear highly probable that they are the young of *Ascaris clavata*. The larger specimens range from 25 to 40 mm. in length, and from 0.6 to 1.1 mm. in diameter.

4. *Cucullanus glabosus* Zeder. [Pl. XVII, fig. 206.]

Nine specimens from the cod, collected by Mr. Vinal N. Edwards in the months of November, December, 1887, and January, 1888, belong to this species. Dimensions in millimeters: Length, male 10.5, female 15; diameter, male 0.4, female 0.35. Tail of female slender and prolonged 0.5 mm. beyond the anal aperture. Length of male copulatory spines, 1.2 mm.

CESTODES.

5. *Dibothrium rugosum* Rudolphi. Pyloric cæca. **2**, pp. 750–754, pl. III, figs. 7–10. **5**, p. 431, pl. XXVIII, figs. 9, 10, and pl. XXIX, figs. 1–4.

6. *Rhynchobothrium imparispine* Linton. Peritoneum. **4**, pp. 799–801, pl. LXIV, figs. 9–12. See **2**, pp. 840–843, pl. XII, figs. 6–9.

TREMATODES.

7. *Nitzschia papillosa* Linton. **6**, p. 508, pl. XL, fig. 1–6.

8. *Distomum rachion* Cobbold (?). **6**, pp. 538–539, pl. LIII, figs. 3–7.

Melanogrammus æglefinus, *Haddock.*

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. See **3**, p. 525, etc.

Found in two lots of entozoa from this host, collected by Vinal N. Edwards in the months of November, 1886, and December, 1885, 10 in one, 4 in the other. The longest, a female, measured 45 mm.; the shortest, a male, 6 mm.

NEMATODES.

2. *Nematodes.* Immature. Encapsuled on peritoneum.

Three lots of encapsuled nematodes from this host in U. S. Nat. Mus. collection. These were collected by V. N. Edwards in November, 1886, and December, 1885. The specimens in two of these lots agree with those from the cod, and are probably the young of *Ascaris clavata*. The longest is about 30 mm. in length. The specimens in the third lot resemble Cobbold's *A. acanthocandata*. Body nearly filiform, but tapers more anteriorly than posteriorly. Dimensions in millimeters: Length, 28; diameter of body 0.75, of head 0.25; distance of anal aperture from posterior end, 0.3; length of œsophagus, 4. In acetic acid two systems of diagonal fibers were brought out.

CESTODES.

3. *Rhynchobothrium imparispine* Linton. Peritoneum. **4**, pp. 799–801, pl. LXIV, figs. 9–12.

Antimora viola.

NEMATODES.

1. *Immature nematodes.* [Pl. XIII, figs. 163–165.]

Seven specimens from peritoneum; U. S. Fish Commission steamer *Albatross*, 811 fathoms. These specimens, which are young ascarids, have the body covered with a thin embryonic investment, which is thrown into transverse folds, raised from the body, and in places sloughing off. In some of the specimens rudimentary lips can be seen. Dimensions in millimeters: Length, 28; diameter of head 0.12, middle 0.5, at anal aperture 0.15; distance of anal aperture from posterior end, 0.15.

Phycis tenuis, *Hake.*

FOOD.

The stomachs examined by me have been empty. The intestines of some alcoholic specimens contained a whitish chyle, which became chalky when dry and contained a large proportion of carbonate of lime.

NEMATODES.

1. *Ascaris* sp. [Pl. VIII, figs. 75–78.]

One specimen, a female, collected by Vinal N. Edwards, November, 1888, appears to be near *A. clavata*. Some of its dimensions in millimeters are: Length, 84; diameter of head 0.36, 1 mm. back of head 0.65, near middle (maximum) 1.85, 1 mm. from posterior end 1.12, at anal aperture 0.72; distance from anal aperture to posterior end 0.37; length of upper lip 0.28, breadth 0.26.

The specimen is attenuate for the anterior third, posterior end coiled; diameter nearly uniform from middle to posterior end. The upper lip is unsymmetrical and no papillæ were seen on it. No lateral alæ were observed.

2. *Immature nematodes* (*Ascaris*). From body cavity. [Pl. XIII, figs. 166, 167.]

Six lots in the U. S. National Museum collection taken from fish captured off Marthas Vineyard in connection with work of the U. S. Fish Commission; one lot collected at Woods Hole, August 28, 1889. The specimens are for the most part from the outside of the alimentary canal. The bottles contained several stomachs and intestines and a single specimen was found in one of the stomachs. This was compared with specimens taken from capsules in the mesentery and found to be identical. Dimensions in millimeters: Length, 21; diameter, head 0.10, near head 0.3, middle 0.44, near posterior 0.3, at anal aperture 0.15; distance anal aperture to posterior end 0.25. The outlines of the young ascaris could be made out within the embryonic cuticle.

3. *Filaria serrata* sp. nov. [Pl. XV, figs. 192–196.] Off Nantucket, 65 fathoms, Aug. 23, 1883.

Body armed with circles of short triangular spines. First circle about 0.1 mm. from the anterior end, length of spines 0.01 mm. The circles become rather indistinct back of the eighteenth, but continue until their number is over 100, as could be seen along the margins of optical sections of the worm. The spines become smaller in the posterior circles. Dimensions of male in millimeters: Length, 5.8; diameter in front of first circle of spines 0.06, at first circle 0.07, middle 0.1, at anal aperture 0.06; distance of anal aperture from posterior end 0.16; lengths of copulatory spines 0.06 and 0.03. Female (specimens not quite complete): Length, 6.5; diameter at first circle of spines, 0.08; maximum diameter, 0.18; ova, 0.04 and 0.02 mm. in the two principal diameters. In the males the œsophagus is sinuous and the anterior end seemed to be inverted. The copulatory spines are unequal, one being long, slender, and sharp-pointed; the other shorter, a little broader, appears to be forked at the base and blunt at the tip. Six postanal and four preanal papillæ were made out on each side. The two posterior papillæ on each side are much smaller than the others and were seen in only one of the specimens.

The male is further characterized by having four longitudinal, serrate rows of small plates in front of the anal aperture. The length of these rows in one specimen was 0.35 mm. The component plates 0.001 mm. in height, of varying length; some measured 0.005 in length.

CESTODES.

4. *Rhynchobothrium.* Cysts on viscera. **4**, p. 795.

TREMATODES.

5. *Distomum hispidum* Abildgaard. Intestine. [Pl. XXIX, figs. 321–323.]

Taken by the schooner *Grampus*, south of Marthas Vineyard, in 65 to 70 fathoms, July 30, 1900; 15. Collected by Mr. C. W. Stone. These distomes are from 3 mm. to 6 mm. in length. The necks are densely clothed with large, coarse spines, and the body covered with short spines; acetabulum much larger than oral sucker. Dimensions in millimeters of a specimen in glycerine somewhat compressed: Length, 4.26; diameter of oral sucker, 0.17; diameter of acetabulum, 0.45; breadth of body, middle, 1.16; diameter of anterior testis, 0.5; length of posterior testis 0.77, breadth 0.5; ovum, 0.086 and 0.055 mm. in the two principal diameters. So far as these specimens have been studied, they agree closely with this species, except that the neck is flattened and tapers gradually but uniformly to the bluntly rounded anterior end, instead of being dilated at its middle part.

Urophycis chuss (*Phycis chuss*), *Hake.*

FOOD.

Shrimps and amphipods noted in alimentary canal of one taken in 30 fathoms off Gay Head, August 5, 1899. Small crustaceans and lenses of small fish in alimentary canals of four young hake taken in Katama Bay, August 30, 1899.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. See **3**, p. 525, etc. Aug. 5, 1899, 19 specimens.

These specimens are smaller and more slender than examples from other hosts, e. g., the flounders, but they appear to agree in all essential particulars with this species.

NEMATODES.

2. *Immature nematodes* (*Ascaris*). Peritoneum.

A small lot belonging to the U. S. National Museum collection, collected by the U. S. Fish Commission in 1887, agree with those mentioned under *Phycis tenuis* No. 2. Also found August 5, 1899, numerous; and August 2, 1900. [Pl. VI, figs. 53, 54.] Identical with No. 2 under *Lopholatilus chamæleonticeps* and No. 2 under *Paralichthys oblongus*.

CESTODES.

3. *Rhynchobothrium.* Encysted on peritoneum. **4**, p. 796. Also found Aug. 5, 1899.

TREMATODES.

4. *Distomum ocreatum* Molin. Intestine. See **7**, p. 288, pl. XXXV, figs. 16–24. Aug. 5, 1899; numerous.

These agree fairly well with this species. The oral sucker exceeds the acetabulum slightly in the preserved specimens, which are contracted and measure 1 mm. or less, excluding the appendix. Ova 0.024 and 0.014 in the two principal diameters.

5. *Distomum appendiculatum* Rudolphi. Intestine. See **7**, p. 289, pl. XXXVI, figs. 25, 26.

Twenty-one distomes from two young hake, seined in Katama Bay, August 28, 1900, are to be referred to this species. They were very active and variable in form. At rest the length is about 2.6 mm. Diameter of oral sucker, 0.09 mm.; of acetabulum, 0.19 mm.; body serrate, neck very short, cirrus pouch behind acetabulum; vitellaria, two and globular; ova, 0.024 and 0.010 mm. in the two principal diameters.

Enchelyopus cimbrius, *Four-bearded Rockling.*

FOOD.

But one specimen examined. This was taken in the trawl net in about 30 fathoms of water off Gay Head, August 5, 1899. Shrimps, amphipods, and a few small univalve mollusks in the alimentary canal.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. One female; agrees with this species in all essentials. See **3**, p. 525, etc.

NEMATODES.

2. *Immature nematodes.*

Rather numerous; different sizes, but all small and immature. Dimensions of one in millimeters: Length, 18; diameter, anterior 0.09, middle 0.6, at base of œsophagus 0.38, at anal aperture 0.19; distance of anal aperture from posterior end, 0.25; length of œsophagus, 0.65. Diverticulum from œsophagus at its juncture with the intestine.

TREMATODES.

3. *Distomum* sp. [Pl. XXIX, fig. 330.]

A small number obtained from the intestine. These resemble *D. tenue*, but oral spines are wanting. The following characterization is based on alcoholic specimens: Body elongate, linear, depressed; neck slightly elongate, equaling about one-fifth of the whole length, armed with minute, flat spines; mouth unarmed; oral sucker somewhat smaller than acetabulum, nearly globular, but with notch on posterior inner border; acetabulum nearly globular, transverse diameter exceeding the length; pharynx oblong, separated by a distance equal to its length from the oral sucker and followed by an œsophagus of equal length; intestinal rami simple, elongate, extending to near the posterior end of the body; testes, two in posterior half, occupying nearly whole diameter of the body, separated from each other by a space equal to the diameter of each; anterior testis preceded by the globular ovary; ova relatively few (50, more or less) and large; vitellaria generally distributed in the body back of acetabulum, especially at posterior end and along margins, in transverse sections appearing as subglobular bodies around the periphery; seminal receptacle dorsal to acetabulum; genital opening in front of the acetabulum and close to it on the median line.

Dimensions of specimen cleared in acetic acid, slightly compressed, in millimeters: Length, 3.62; diameter, middle of neck 0.32, maximum 0.5, near posterior end 0.3, transverse of oral sucker 0.13 (in another specimen 0.11), transverse of acetabulum 0.17 (in another 0.13); pharynx, length 0.12, breadth 0.07; diameter, of ovary 0.23, of anterior testis 0.32, of posterior testis 0.35; ova, 0.07 and 0.04 in the two principal diameters. Spines seen only on the neck, longest on ventral side of neck, where they are about 0.006 mm. in length. In one specimen the oral sucker nearly equaled the acetabulum, the diameters being 0.27 and 0.29 mm. These specimens resemble *D. increscens* Olsson, but differ from that species in the proportions of the suckers and in the position of the genital aperture.

Brosmius brosme, *Ling.*

U. S. National Museum collection. The label reads: "Ling, stomach, U. S. Fish Commission steamer *Albatross*, station 2577, 1885." This station was established September 4, 1885, off Marthas Vineyard; depth, 32 fathoms.

NEMATODES.

1. *Ascaris* sp. Immature. Stomach.

Ten and 3 fragments. Length, about 25 mm.; attenuate anteriorly, thickened toward posterior end, which is short-pointed and mucronate; surface of body crossed by fine transverse striæ, most easily seen toward the posterior end. Dimensions in millimeters of a male and a female, the dimensions of the male given first: Length, 25 and 25; diameter of head 0.2 and 0.2, 2 mm. back of head 0.35 and 0.45, middle 0.50 and 0.63, 2 mm. from posterior end 0.6 and 0.62, at anal aperture 0.15 and 0.3; distance of anal aperture from posterior end, 0.18 and 0.4; length of head, 0.15 and 0.17. The breadth of the upper lip in the male was 0.14 and its length 0.15; length of copulatory spines 1.3, of œsophagus 3; no papillæ were made out. Some variability was noted in the proportions of the upper lip in different specimens. There was, however, but little difference between the length and the breadth. The length was not less than the breadth, but it did not exceed the breadth much in any case.

Nematonurus goodei (*Macrurus asper*).

NEMATODES.

1. *Ascaris linstowi* sp. nov. Stomach. [Pl. III, figs. 23–25, and pl. IV, figs. 26–28.]

Two specimens, a male and a female, from this deep-water fish were collected from a fish taken by the U. S. Fish Commission off the southern coast of New England in 1884. While these specimens resemble Linstow's *A. macruri* and still more closely his *A. macruroidei* (Challenger Report, vol. XXIII, part LXXI, p. 7, 8, pl. I, figs. 10, 11, text figure 1), they can not be referred to either. The bodies are

attenuate anteriorly, the greatest diameter being not far from the posterior end. The postanal portion is slender but more acute in the male than in the female. In the male the posterior end is recurved. The body is crossed by very fine transverse striæ. The lips are without tooth plates. The upper lip is somewhat elliptical, its dimensions in the female being, length 0.2 mm., breadth at middle 0.19 mm., breadth at base 0.1 mm. Six postanal papillæ were made out in the male, two pairs remote from the anus and one pair near. Twelve preanal papillæ were seen—that is, two groups of three each—on each side; the papillæ in the anterior group not so close together as those in the posterior group, which lies a short distance in front of the anal aperture.

Dimensions of the two specimens in millimeters, the numbers for the male standing first: Length, 33 and 56; diameter of head 0.2 and 0.3, 2 mm. back of head 0.5 and 0.7, maximum (near posterior end) 0.68 and 1.46, 2 mm. from posterior end 0.68 and 0.9, at anal aperture 0.24 and 0.5; distance from anal aperture to posterior end 0.2 and 1.10; length of œsophagus, male 2.44; length of copulatory spines, 2.3.

Macrourus bairdii, *Baird's Grenadier.*

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi.

U. S. National Museum collection; collected by the U. S. Fish Commission, station 894. Largest specimen in this lot measures 21 mm. in length; diameter near anterior end 1.1 mm., near middle 0.8 mm., near posterior end 0.6 mm. In a male of this lot the number and arrangement of testes, cement glands, and vas deferens agreed with the specimens from the flat-fish. See **3**, p. 525, etc.

NEMATODES.

2. *Ascaris* sp. Immature. [Pl. XIV, figs. 173–178.]

U. S. National Museum collection, four lots, collected by the U. S. Fish Commission steamer *Albatross*, stations 894, 2201, and 2739. These are all immature and range in length from 15 mm. to 33 mm. In most of the specimens the embryonic cuticle was still attached, but in the process of sloughing off. There is considerable variation in the lips and in the appearance of the posterior end with the degree of development. On this account it is exceedingly difficult to characterize these immature nematodes briefly. Dimensions of one in millimeters are given: Length, 32; diameter of head 0.17, near head 0.25, middle 0.6, near posterior end 0.33, at anal aperture 0.25, 5 mm. back of head 0.65, 5 mm. from posterior end 0.55; length of œsophagus, 3.3; distance from anal aperture to posterior end, 0.45. In a specimen measuring 33 mm. in length the greatest diameter was about 10 mm. from the posterior end. The body is smooth except for exceedingly minute transverse lines; lateral jaws with about three teeth; upper lip without papillæ, at least none were made out; length and breadth of lips nearly equal. The interlip in most is very short.

3. *Undetermined nematode.* Stomach. [Pl. XIX, figs. 224–227.]

A nematode which resembles some of the free forms like *Enoplus* was found in the U. S. National Museum collection from the stomach of this host, U. S. Fish Commission station 894. This is one of the dredging stations established by the steamer *Fish Hawk*, October 2, 1880; depth, 365 fathoms. The specimens are slender-fusiform, with a tendency to assume an arcuate position. Four pairs of small, gently curving spines were counted around the mouth of one of the specimens, and a few others a short distance back of the head. The anterior end was retracted in one so that the specimen bore some resemblance superficially to *Echinorhynchus;* posterior end acuminate. Body wall rather thick and dense, with a few delicate longitudinal fibers and exceedingly minute and crowded transverse fibers. The œsophagus is long and slender. About midway of its length a muscular sheath of coarse longitudinal fibers begins, which incloses its basal portion, and, continuing, envelops the intestine and reproductive organs. A reproductive opening was noticed in one specimen a little in front of the middle in the wall of the muscular sheath. The aperture in the outside wall did not quite coincide with it, but had probably been displaced by the distortion of the specimen under the cover glass. Dimensions in millimeters: Length, 12.5; diameter, anterior 0.12, middle 0.4, at anal aperture 0.13; distance of anal aperture from posterior end, 0.22; length of œsophagus, 1.54; distance of reproductive aperture from head, 5.5; transverse diameter of reproductive aperture 0.024, axial diameter 0.018. The reproductive aperture was surrounded by a sphincter 0.01 mm. thick.

CESTODES.

4. *Rhynchobothrium.* Cysts. **4**, p. 796, pl. LXIII, figs. 7, 8.

TREMATODES.

5. *Distomum laeve* Linton. **6,** pp. 517–518, pl. XLIII, figs. 5–8; pl. XLIV, fig. 1.

Hippoglossus platessoides, *Sand-dab.*

NEMATODES.

1. *Ascaris incurva* Rudolphi (?); young.

Two immature specimens obtained from rectum of a sand-dab by Mr. B. A. Bean. The fish was taken off Race Point in 34 fathoms, August 25, 1899. The head agrees with this species; the tail, however, is too blunt unless they are immature males, which appears to be the case. Dimensions in millimeters: Length, 25; diameter, head 0.20, at base of œsophagus 0.58, middle 0.84, at anal aperture 0.23, one millimeter from posterior end 0.51; length of head 0.19, of œsophagus 3.84; distance from anal aperture to posterior end, 0.22. There appears to be an anterior prolongation of intestine parallel with œsophagus, 1.45 mm. in length. The intestine near the posterior end is capacious, with crumpled walls.

2. *Ichthyonema* sp. Intestine.

A slender nematode collected August 8, 1899. Almost the entire body was filled with elliptical ova 0.041 and 0.024 mm. in the two principal diameters. Slender attenuate anteriorly, more rapidly attenuate and acute at posterior end. Other dimensions in millimeters: Œsophagus at anterior end 0.058 in diameter, nearly cylindrical for a distance of 0.43, where it increases abruptly from 0.072 to 0.094, increasing thence to the base, where it is 0.26 in diameter; whole length of œsophagus, 3.9; length of worm, 15; diameter, anterior 0.06, middle 0.4.

Paralichthys dentatus, *Flounder.*

FOOD.

The stomachs usually contain fish and squid. In one case 18 squid were taken from the stomach of a single flounder. A hermit crab along with fish, squid, small fish and crustaceans, are other records of contents of alimentary canals of the flounder.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. **3,** pp. 525–528, pl. LX, figs. 89, 90.
2. *Echinorhynchus proteus* Westrumb. On mesentery. **7,** p. 283.
3. *Echinorhynchus incrassatus* Molin. Peritoneum. **3,** pp. 533–534, pl. LVIII, figs. 54–69*a*. July 18, 1899.
4. *Echinorhynchus sagittifer* Linton. On viscera. **1,** pp. 493–496, pl. VI, figs. 1, 2. **3,** pp. 535–536, pl. LIX, fig. 80.

NEMATODES.

5. *Immature nematodes* (*Ascaris*). [Pl. XII, figs. 143–146; pl. XIII, figs. 147–151.]

Of very frequent occurrence, encapsuled in the mesentery and on the viscera, 1884 to 1889. Flounders were examined in 1899 on sixteen dates and nematodes recorded on nine of these. They were examined on five dates in 1900 and nematodes recorded on each date. They occurred in varying numbers, though only once numerous.

6. *Ascaris* (?) sp. Intestine. [Pl. VII, figs. 57–61.]

Two specimens obtained on August 9 and one on August 23, 1900; all females, active and mature. These worms are small, white, translucent. The mouth is relatively large and surrounded by three low, inconspicuous, rounded lobes, each of which is provided on its inner surface with a large number of minute teeth and apparently a single papilla. The body is short, cylindrical, truncate in front, slender pointed at posterior end. The diameter equals about one-tenth of the entire length. It is nearly uniform from the anterior end to the middle, or a little behind the middle; that is, about to the genital opening, whence it tapers very gradually toward the posterior end, narrowing rapidly just in front of the anus and likewise just at the anus. The tip is slender, but short acuminate. The intestine is capacious. A short anterior diverticulum embraces the base of the œsophagus on one side and a longer one on the other. The ovaries are voluminous, the genital opening a little behind the middle of the length.

Dimensions of living worm in millimeters: Length, 4; distance of genital aperture from anterior end, 2.3; length of œsophagus, 0.65; diameter of head 0.23, at genital aperture 0.38, two-tenths of a millimeter in front of the anal aperture 0.25, at anal aperture 0.09; distance of anal aperture from posterior end, 0.11.

7. *Ichthyonema sanguineum* Rudolphi. Mouth. **7**, pp. 283, 304, pl. XLIII, figs. 120, 121.

CESTODES.

8. *Larval cestodes* (*Scolex polymorphus* Dujardin). In cystic duct and free in intestine. **4**, pp. 789–792, pl. LXI, figs. 4–15. **7**, p. 283.

Found frequently in 1899 and 1900. I have not been making observations on these forms (*Scolex polymorphus*) for a good many years. I have recorded their occurrence, however, whenever observed. No doubt if special search were made for them their known range in American fishes could be greatly extended. On August 23, 1900, I noted these larvæ in the flounder, and found among them forms with a very distinct costa on the bothrium. Red pigment spots were present in the neck, and the terminal sucker was conspicuous. While I was watching them I noticed that four had attached themselves to the scolex of a tetrarhynchus, which was in the same dish, thus becoming ecto-parasites, or carnivorous enemies of the latter.

9. *Rhynchobothrium bulbifer* Linton. Cysts on viscera.

Larval cestodes encysted in the mesentery are very common, and have been noted on various occasions. Many of them have been too immature for identification. Noted on six dates in 1899 and on four in 1900. **4**, p. 767. **7**, p. 283. Some of these small cysts contained larvæ with proboscides resembling those figured in **4**, pl. LXIII, fig. 12.

10. *Rhynchobothrium imparispine* Linton. On viscera. **4**, pp. 799–801, pl. LXIV, figs. 9–12.
11. *Rhynchobothrium heterospine* Linton. On viscera. **7**, p. 283. See **4**, p. 799, pl. LXIV, figs. 3–8.
12. *Rhynchobothrium speciosum* Linton. On viscera. **4**, pp. 801–805, pl. LXIV, figs. 13, 14, and pl. LXV, figs. 1–7.
13. *Tetrarhynchus bisulcatus* Linton. In submucosa of stomach. **4**, pp. 810–811, pl. LXVI, figs. 11–15. **7**, p. 283.

Cysts with larvæ (*Tetrarhynchus*) found very frequently in submucosa of stomach in 1899 and 1900. Some appear to be *T. robustus* (**4**, p. 452), but the most of them are *T. bisulcatus*.

14. *Tetrarhynchus bicolor* Bartels.

A single specimen, August 15, 1899, in material washed out of alimentary canal. Color, white. In other particulars it agrees with this species; length, 3.5 mm. See **4**, pp. 813–815, pl. LXVIII, figs. 1–6.

15. *Syndothrium filicolle* Linton. Encysted in stomach wall. **4**, p. 817, pl. LXVIII, fig. 8.

TREMATODES.

16. *Dictidophora affinis* Linton. [*Octoplectanum affine* Linton.] Mouth. **4**, pp. 511–512, pl. XL, figs. 10–13, and pl. XLI, figs. 1–5. Found twice in 1899 and once in 1900, one in each find.
17. *Distomum appendiculatum* Rudolphi. Intestine. **7**, pp. 283, 289, pl. XXXVI, figs. 25, 26. July 15, 1899; 2.
18. *Distomum monticelli* Linton. Intestine. Aug. 18, 1899; 1. See **4**, pp. 518–520, pl. XLIV, figs. 2–8.
19. *Distomum vitellosum* Linton. Intestine. Aug. 23, 1899. July 26, 1900, few. See **7**, p. 290, pl. XXXVII, figs. 38, 39.

Two small distomes were obtained from a flounder from Muskeget Channel, August 17, 1899, which resemble this species in the general arrangement of the reproductive organs and proportions of the acetabula, etc. The bodies, however, were transversely corrugated in a very peculiar manner. This has been alluded to under *Microgaster* (No. 6, *D. simplex*). The posterior edge of the acetabulum was deeply notched so as to form two or three blunt, digitate lobes. [Pl. XXX, fig. 336.]

20. *Distomum pudens* Linton. **7**, pp. 283, 290–291, pl. XXXVII, figs. 40–47.
21. *Distomum* sp. [Pl. XXXI, fig. 345, pl. XXXII, fig. 352.]

Three small distomes collected August 22, 1899, are here referred to briefly. They bear a close resemblance to No. 11 under *Rhombus triacanthus*. One of these was sketched at the time of collecting (fig. 352). This specimen bears some resemblance to *D. pudens*, but the œsophagus is much longer

than in the forms upon which that species was based. No spines were noted, but the body was crossed by fine transverse striæ. Dimensions of living specimen in millimeters: Length, 1.19; diameter, anterior 0.08, middle 0.23, of oral sucker 0.07, of acetabulum 0.07; ova, 0.052 and 0.034 in the two principal diameters. Spherical bodies were noted in the excretory vessels. Associated with this distome were two smaller, oval, minutely spinose distomes. Dimensions, life, in millimeters: Length, 0.73; diameter, anterior 0.1, middle 0.34, of anterior sucker 0.07, acetabulum 0.08; ova, 0.065 and 0.04 mm. in the two principal diameters; diameter of spherical bodies, 0.02. An immature distome collected August 30 probably belongs to this species (fig. 345). Some of these small oval distomes resemble *D. pyriforme*.

22. *Distomum dentatum* Linton. Intestine. **7**, pp. 283, 294, pl. XXXIX, figs. 64–67.

Found on seven different dates in 1899. July 26, 1900, adults with ova, smaller without; the young were relatively much more slender than the adults. August 9, 1900; numerous. August 10, 1900; about 12, large and small. The following note was made at the time of collecting the specimens referred to this species on August 9: Younger specimens translucent, bluish, older specimens yellowish. A few of the older ones without spines thought at first to be different species. Seen by making comparative measurements to be the same except for the matter of spines, and that the ova in the spineless ones seemed to be a little larger. Either these spineless forms will prove to belong to some species like *D. vitellosum* or *D. simplex* or they will have to be regarded as examples of *D. dentatum* which have lost not only the large spines from the mouth, but the smaller spines from the body as well. A reexamination of these specimens leads me to conclude that those which do not have the spines around the mouth belong to this species. The oral spines are evidently lost in the older worms. Three distomes collected August 14, 1899, were thought at first to belong to a different species, on account of what appeared to be a peculiarity in the structure of the oral spines. These appeared to be directed forward and to be hastate in shape. This appearance was later found to be due to the fact that the oral sucker was everted to such an extent as to bring the bases of the spines in focus first. The only important differences observable between these specimens and the *D. dentatum* as originally described is that the opening of the acetabulum is round instead of transverse, and the pharynx pyriform, broader than long, in alcoholic specimens, but such characters should be given little weight in the determination of distomes. The following measurements are given for the purpose of comparison with those given in the description of the species. Dimensions of living specimen in millimeters: Length, 2.86; diameter at anterior sucker 0.29, at acetabulum 0.76, middle 0.75, posterior 0.42; oral sucker, length 0.24, breadth 0.24; acetabulum, length 0.23, breadth 0.24; pharynx, length 0.19, breadth 0.18; length of oral spines, longer 0.03, shorter 0.02; length of body spines, 0.017; ova, 0.079 and 0.041 in the two principal diameters. Dimensions of alcoholic specimen in millimeters: Length, 2.03; transverse diameter of oral sucker 0.17, of acetabulum 0.2; pharynx, length 0.1, breadth 0.16; ova, length from 0.055 to 0.072, breadth 0.038 to 0.041; anterior border of acetabulum 0.5 from anterior end. The distome noted in **7**, p. 296, pl. XL, figs. 73–75, may be a specimen of *D. dentatum* which has lost the oral spines.

RHYNCHOBDELLIDA.

23. *Leech*. From mouth. This is probably a young specimen of *Pontobdella rapax* Verrill. See under *Stenotomus*, No. 14.

The specimen was red when first seen. After lying overnight in water it became yellowish green, and when put in Gilson's mecuro-nitric solution changed to a decided grass-green. July 24, 1899. Dimensions in millimeters, alcoholic: Length, 8.25; diameter (maximum) of body 0.42, of posterior sucker 0.57, of anterior sucker 0.42, of neck 0.28.

Paralichthys oblongus, *Four-spotted Flounder*.

FOOD.

August 5, 1899; 4. Taken in the trawl in about 30 fathoms of water off Gay Head: Shrimps, amphipods, and other small crustaceans, annelids, a small lamellibranch mollusk, shell of *Utriculus canaliculatus*, and another univalve shell with a worm tube on it in alimentary tracts. Aug. 16, 1899; 4. Large numbers of amphipods, shrimps, etc., a few small crabs, and small fish in alimentary tracts. August 2, 1900; 4. Taken in Muskeget Channel. Small crabs (*Cancer*) and shrimps in stomach.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. Aug. 16, 1899; 1. See **3**, p. 525, etc.

NEMATODES.

2. *Immature nematodes* (*Ascaris*). [Pl. XIII, figs. 152, 153.]

Found on each of the dates given above. These appear to be identical with small nematodes found in a number of different species of fish. Some of these were compared with specimens from *Urophycis chuss* and *Lopholatilus chamaeonticeps*. All of these were living at the time. They agreed in all essential characters. At the junction of the œsophagus and intestine there is a diverticulum from each, one from the intestine which extends forward parallel with the œsophagus and one from the œsophagus which extends backward parallel with the intestine.

Dimensions in millimeters of a small specimen collected August 2, 1900: Length, 10.5; diameter of head, 0.07; diameter at nerve ring, 0.17; diameter at anal aperture, 0.11; distance of nerve ring from anterior end, 0.36; length of œsophagus, 1.45; distance of anal aperture from posterior end, 0.19.

Figs. 152 and 153 are sketches of a specimen from a lot of immature nematodes collected by the U. S. Fish Commission in 1883, station 1158. Length, 22 mm., of nearly uniform diameter throughout (0.4 mm.); distance of anal aperture from posterior end, 0.15; diameter at anal aperture, 0.12.

CESTODES.

3. *Dibothrium punctatum* Rudolphi.

A small, slender, immature specimen from the intestine, collected August 16, 1899, probably belongs to this species. See **2**, pp. 731–736, pl. II, figs. 1–4.

4. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. Found both in 1899 and 1900. See **4**, pp. 789–792, etc.

5 *Rhynchobothrium*. Encysted on viscera. Found in 1899. **4**, p. 798.

6 *Tetrarhynchus bisulcatus* Linton. Submucosa of stomach. Found in 1899 and 1900. See **4**, p. 810, etc.

Bothus maculatus (*Lophopsetta maculata*), *Sand-dab, Window-pane.*

NEMATODES.

1. *Immature nematodes* (*Ascaris*).

Common in this as in the other flounders, encapsuled on viscera. A small lot in the U. S. National Museum collection from the Grand Banks (schooner *J. A. Chapman*) in poor condition, as if macerated, from turbot, here recorded. Lengths, 37 mm. to 55 mm.; greatest diameter, 2 mm. Anteriorly attenuate. [Pl. XIII, figs. 154–156.]

CESTODES.

2 *Dibothrium punctatum* Rudolphi. Intestine. **1**, pp. 731–736, pl. II, figs. 1–4. **5**, p. 430.

3. *Rhynchobothrium imparispine* Linton. **4**, pp. 799–801, pl. LXIV, figs. 9–12.

Limanda ferruginea, *Rusty Flat-fish.*

FOOD.

The alimentary tract in some cases contained enormous numbers of crustaceans; of these, amphipods were most numerous, but shrimps, schizopods, small crabs, *Caprella*, and *Squilla* also found; annelids, different species; bivalve and univalve mollusks; small fish.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. **3**, p. 525, etc.

In two lots of the U. S. National Museum collection. Off Block Island, 1880. August 5, 1899. August 16, 1900; 30, a few quite small. August 2, 1900; 14.

NEMATODES.

2. *Immature nematodes* (*Ascaris*).

August 5 and 16, 1899. These are similar to immature nematodes found in a great variety of fishes. Most of those which I have seen appear to be young ascarids.

CESTODES.

3. *Dibothrium punctatum* Rudolphi. Intestine. **2**, pp. 731–736, pl. II, figs. 1–4. **5**, p. 430. **7**, p. 284. July 21, 1899; 2, length 8 mm. and 180 mm. Aug 2, 1900; 1.
4. *Larval cestodes (Scolex polymorphus* Dujardin). Free in intestine. **1**, pp. 789–792, pl. LXI, figs. 4–15. Aug. 2, 1900.
5. *Rhynchobothrium imparispine* Linton. July 21, 1899. Encysted on viscera. See **5**, p. 799, etc. Other Rhynchobothrium cysts not identified July 21 and August 6, 1899.

TREMATODES.

6. *Distomum vitellosum* Linton. Intestine. July 21, 1899; about 45. See **7**, p. 290.
7. *Distomum simplex* Rudolphi. Intestine. Aug. 16, 1899; 25, length 2 mm. to 4 mm.; ova, 0.099 mm. and 0.055 mm. in the two principal diameters.
8. *Distomum* sp. Intestine. [Pl. XXXII, fig. 359, and pl. XXXIII, figs. 360–362.] Aug. 16, 1899; 5. Aug. 2, 1900; 1.

These are small fusiform distomes with the following diagnostic characters: Body smooth, fusiform, thickest about the middle, tapering nearly equally to each end. Anterior sucker subterminal, circular, aperture somewhat triangular in preserved specimens. Acetabulum a little in front of middle, larger than oral sucker, aperture nearly circular. Pharynx subglobular, close to oral sucker, œsophagus distinct. Intestinal rami simple, extending to the ovary. Vitellaria distributed in the median regions of the body from testes to pharynx. Testes two, rather large, placed a little diagonally on the median line near posterior end of body. Ovary smaller than testes, subglobular or slightly lobed, situated in front of anterior testis and to the right. Ova few, large, in front of ovary. Cirrus pouch to right of acetabulum. Genital aperture about halfway between acetabulum and oral sucker, to right of median line, at about midway between pharynx and acetabulum. Dimensions of living specimen, in millimeters: Length, 2.57; diameter, anterior 0.25, middle 0.93, posterior 0.21; diameter of oral sucker 0.21, of acetabulum 0.36; anterior testis, length 0.43, breadth 0.36; posterior testis, length 0.43, breadth 0.37; ova, 0.065 and 0.041 in the two principal diameters. Length of another specimen, 1.57. Dimensions measured from transverse sections: Diameter of oral sucker 0.19, of acetabulum 0.33, of ovary 0.17, of testes, each 0.3. The ratio of oral sucker to acetabulum is somewhat different from the foregoing, their diameters in one of the specimens being 0.14 mm. and 0.17 mm. This for a specimen in glycerine. This species has some resemblance to *D. commune* Olsson. Its resemblance to the fusiform distome which I have referred to *D. bothryophoron* Olsson is only superficial.

Pseudopleuronectes americanus, *Flat-fish*, *Winter Flounder*.

FOOD.

A specimen examined August 16, 1899, had in the alimentary canal large numbers of shrimps and other small crustaceans and one small fish. Four small specimens from Katama Bay, August 30, had, in their alimentary tracts, both univalve and bivalve shells, small crustaceans, and annelids. An equal number, also small, from same locality, July 27, 1900, contained nereis and fragments of red seaweed with sand.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. **1**, pp. 492–493, pl. V, figs. 7–13. **3**, pp. 525–528, pl. LIII, figs. 1–11, and pl. LX, figs. 89, 90. **7**, p. 284.

In eleven lots in U. S. National Museum collection, seven of them collected by V. N. Edwards in October, November, and December, 1887, 1888, the others taken off Newport at Fish Commission dredging stations Nos. 789, 796, 861. In most of these lots the specimens are numerous, 350 having been counted in one of them. Found in this host July 21 and August 30, 1899, and July 27, 1900.

NEMATODES.

2. *Immature nematodes* (*Ascaris*).

These resemble the forms mentioned under *P. oblongus*, No. 2, July 27, 1900.

2*a*. *Ascaris* sp. [Pl. IX, figs. 88, 89.]

One specimen, a male, collected July 23, 1889. Moderately attenuate anteriorly and very little

attenuate posteriorly; lips with papillæ and dentigerous; body rather rigid and crossed by uniform transverse wrinkles; no alæ; postanal region short conical, tip slightly mucronate. Two postanal papillæ seen, and at least twenty preanal papillæ counted on one side; spines, slender. Dimensions in millimeters: Length, 17; diameter of head 0.18, 1 mm. back of head 0.32, maximum 0.65, 1 mm. from posterior end 0.47, at anal aperture 0.18; distance of anal aperture from posterior end, 0.13; length of œsophagus, 2.8; upper lip, length 0.16, breadth 0.14.

CESTODES.

3. *Tetrarhynchus bisulcatus* Linton. Encysted in stomach wall. Aug. 16, 1900. See **4**, p. 810, etc.
4. *Tetrarhynchus*. Encysted on peritoneum. **4**, p. 809.

TREMATODES.

5. *Distomum appendiculatum* Rudolphi. Intestine. Aug. 16, 1899; few. See **7**, p. 289.
6. *Distomum grandiporum* Rudolphi. Intestine. Aug. 10, 1900; 1. See **6**, pp. 520–521, pl. XLIV, fig. 9.

This specimen agrees with published descriptions of this species very closely. Body smooth, translucent yellowish white by transmitted light. During life the worm was yellowish-white with reflected light, suckers pale; genitalia generally, including the uterus, opaque white; intestine conspicuous, dark brown, rami unbranched, but with irregular outline, extending to posterior end. Some of the dark-brown contents of the intestine ejected from the mouth while the worm was under pressure. The worm was very active, and the caudal appendix was long, slender, and attenuate. While under pressure the worm naturally lay on its side. In that position the acetabulum was seen to be much larger than the oral sucker. The worm showed a disposition to double up and adhere by both suckers to the posterior part of the body; while so doing considerable portions would be drawn inside the cavities of the suckers. When placed in the killing fluid it contracted to about 5 mm. and became cylindrical and plump.

7. *Distomum globiporum* Rudolphi (?). Intestine. [Pl. XXXI, fig. 347.] Aug. 30, 1899; 3.

These specimens agree very closely with descriptions of this species. About the only difference that I note is that in these the œsophagus is not longer than the pharynx. Dimensions of a specimen in glycerine given in millimeters: Length, 4.35; diameter, anterior 0.51, middle 1, posterior 0.22, of oral sucker 0.33, of acetabulum 0.36; pharynx globular, diameter 0.16; anterior testis, length, 0.58, breadth 0.62; posterior testis, length 0.53, breadth 0.58; ovary globular, diameter 0.22; ova, 0.71 and 0.50 in the two principal diameters. But one ovum was seen in the specimen measured. The ovary lies a little to the right of the median line. It is immediately preceded by the cirrus pouch. The cirrus passes to right of acetabulum and opens at its anterior border on the median line. The acetabulum is situated at about the anterior fourth. Testes close together on median line, a little back of middle. Vitellaria fill posterior part of body back of testes and extend laterally nearly to the acetabulum. These specimens closely resemble those referred to *D. simplex*, but differ in size and in the proportions of the suckers.

8. *Distomum vitellosum* Linton. Intestine. **7**, p. 290. [Pl. XXX, fig. 340, *a*, *b*.] Aug. 16, 1899.

A few small distomes, of exceedingly variable form while living, suggest *D. commune* Olsson (Ent. Skand. Hafsfisk, II, p. 13, IV, p. 79). Body smooth, cylindrical; acetabulum prominent, much larger than oral sucker. Length of alcoholic specimen, 0.87 mm.; diameter, 0.36 mm. A living specimen, 1 mm. in length when contracted, measured 1.72 mm. a few seconds afterwards. In life the transverse diameter of the oral sucker was 0.14 mm., of the acetabulum 0.24 mm. An ovum measured 0.048 and 0.031 mm. in the two principal diameters. In alcoholic specimens the body is elliptical-oblong, the neck is very short, conical. The acetabulum is twice the diameter of the oral sucker, and has a narrow, transverse opening. The œsophagus is short, the pharynx rather large and globose. The vitellaria extend from posterior end to the acetabulum. Genital aperture in front of acetabulum to the left of the median line. The habit of the body is rather stouter, and its walls appeared to be somewhat more resistant than *D. vitellosum*; otherwise the agreement with that species is very close.

9. *Distomum arcolatum* Rudolphi. Aug. 5, 1899; numerous. See **7**, p. 293, pl. XXXIX, figs. 60–63.
10. *Distomum* sp. In globular cysts on viscera and in intestinal walls. Aug. 30, 1899.

PROTOZOA.

11. *Sporozoa*. [Pl. I, fig. 4.]

Two small specimens from Katama Bay were examined August 28, 1900. The walls of the intestine of one throughout almost the entire length and of the other for a short distance were completely covered with sporocysts. The cysts were irregular where crowded together; where not crowded together, which was in but few places, they were elliptical or spherical, of various sizes, but comparatively few reaching 1 mm. in diameter and none much exceeding that. Spores oblong-ovate about 0.003 mm. in length by 0.0015 mm. in diameter. Intestine where affected was chalky-white in color.

Glyptocephalus cynoglossus, *Craig Flounder*.

NEMATODES.

1. *Ascaris* sp. Immature. [Pl. IX, figs. 95, 96.]

One specimen, which agrees closely with No. 1 under *Hemitripterus americanus* in the U. S. National Museum collection; locality not given. The habit of the body is stouter than that of the specimens from the sea raven, and the upper lip is relatively larger and more oval. It is somewhat attenuate in front, increasing posteriorly; short pointed back of anal aperture, with mucronate tip. The latter, when highly magnified, is seen to be rough tuberculate and the anal aperture has prominent rounded lips. Measurements in millimeters: Length, 40; diameter of head 0.33, 3 mm. back of head 0.58, maximum 1.5, 3 mm. in front of anal aperture 1, at anal aperture 0.48; distance of anal aperture from posterior tip, 0.48.

Achirus fasciatus, *Hog-choker*.

FOOD.

Eight specimens examined August 2 and eleven on August 11, this summer (1900), had only vegetable débris (*Fucus* and eelgrass) in the alimentary canals.

TREMATODES.

1. *Distomum appendiculatum* Rudolphi. Intestine. One specimen Aug. 10, 1900. See **7**, p. 289.

This distome was found in two other species of fish (alewife and sea robin) taken in seine at the same time as the host of this worm. These fish were taken at the head of Buzzards Bay, at Wareham.

2. Two small distomes, young. [Pl. XXXI, fig. 351.]

One of these distomes, when flattened under the compressor, was elliptical in outline. Dimensions of living specimen in millimeters: Length, 0.26; breadth, 0.20; oral sucker, length 0.07, breadth 0.06; acetabulum, diameter 0.05.

Lophius piscatorius, *Goose-fish*.

FOOD.

Aug. 30, 1887.—A specimen taken south of Cuttyhunk had in its stomach a large quantity of mud which was rich in mollusca, annelids, and small crustaceans.

Aug. 5, 1899.—A small specimen had in stomach a winter flounder almost as large as the goose-fish.

Aug. 18, 1899.—Alimentary canal with fragments of fish.

ACANTHOCEPHALA.

1. *Echinorhynchus acus* Rudolphi. Intestine. **3**, p. 525, etc. **7**, p. 284. Aug., 1899; 3.
2. *Echinorhynchus inerassatus* Molin. Peritoneum. **3**, pp. 533–534, pl. LVIII, figs. 54–69*a*.

NEMATODES.

3. *Ascaris increscens* Molin. [Pl. VIII, fig. 64.]

U. S. National Museum collection; Vinal N. Edwards, collector; five specimens; females. Body slender, attenuate anteriorly, of nearly uniform size for the posterior two-thirds of the length. The

lateral alæ extend about 2 mm. back of head and are about one-tenth mm. broad at the widest part. Postanal region short, conical. Dimensions of one of the specimens in millimeters: Length, 37; diameter of head 0.18, maximum of body 0.5, 1 mm. from posterior end 0.45, at anal aperture 0.18; distance of anal aperture from posterior end, 0.15; length of œsophagus, 3.5.

4. *Immature nematodes* (*Ascaris*). [Pl. xv, figs. 185–187.]

A. From intestine. Numerous examples of immature nematodes were found in the intestine of a goose-fish August 30, 1887. Body of nearly uniform diameter, tapering nearly equally to each end; greatest diameter a little in front of middle; body crossed with regular transverse striæ. Dimensions in millimeters: Length, 8; diameter 1 mm. back of head 0.36, 1 mm. from posterior end 0.28, at anal aperture 0.11; distance of anal aperture from posterior end, 0.22; length of œsophagus, 1.5.

B. Encapsuled in peritoneum, over viscera generally, and sometimes on wall of body cavity [pl. xiv, figs. 179, 180]; often in great numbers. I have record of three finds of these worms, July and August. In the U. S. National Museum collection there are 11 lots from this host, nearly all collected by Mr. Vinal N. Edwards. In most cases the specimens are of various sizes up to 45 mm. and 48 mm. in length. In the larger specimens the posterior ends are more abruptly pointed than in the smaller, suggesting *A. increscens*. Bodies crossed by fine transverse striæ. The worms are usually coiled in a helix or flat coil, and sometimes are surrounded with a brown, waxy secretion of degenerate connective tissue in the capsule. In one lot a few were seen to be penetrating the walls of the stomach. In one of the lots three immature females were found in which the upper lip corresponds with Schneider's figure of *Ascaris rigida* Rudolphi. The body is slender, tapering for a short distance at each end, crossed by exceedingly delicate transverse striæ, which are about 0.003 mm. apart. Dimensions in millimeters: Length, 18; diameter of head 0.12, of body 0.33, at anal aperture 0.11; distance of anal aperture from posterior end, 0.15.

5. *Cucullanus globosus* Zeder. [Pl. xvii, fig. 205.]

A single specimen, a male from the intestine of a goose-fish, agrees with those from the cod, which I have referred to this species. See under *Gadus callarias*, No. 3. Dimensions, in millimeters: Length, 12; diameter of head 0.3, maximum of body near base of œsophagus 0.3; length of œsophagus, 1.55; length of copulatory spines, 1; axial diameter of bursa, 0.38.

CESTODES.

6. *Larval cestodes* (*Scolex polymorphus* Dujardin). Free in intestine. **1**, p. 454, pl. vi, figs. 8, 9. **4**, p. 789, etc. **7**, p. 284. Found also Aug. 5 and 18, 1899, and Aug. 20, 1900. On latter date numerous, with two red pigment patches in neck.
7. *Rhynchobothrium imparispine* Linton. Encysted. **4**, p. 800, pl. lxiv, fig. 12.
8. *Rhynchobothrium speciosum* Linton. Encysted. See **4**, p. 801, etc. **7**, p. 284. Found Aug. 18, 1899, in cysts on intestine.
9. *Tetrarhynchus* (?). Cysts. **4**, p. 809.

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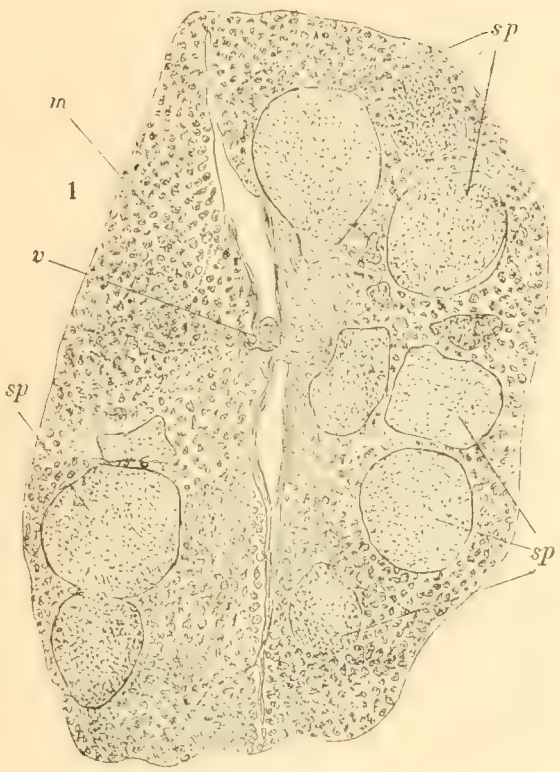
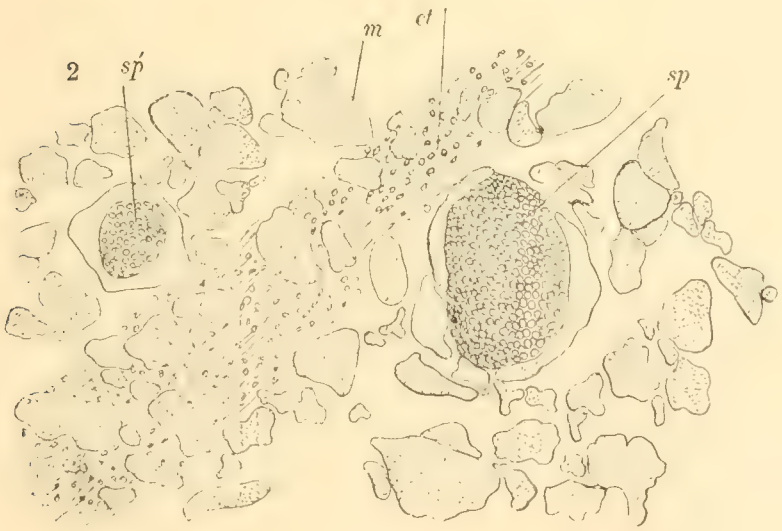
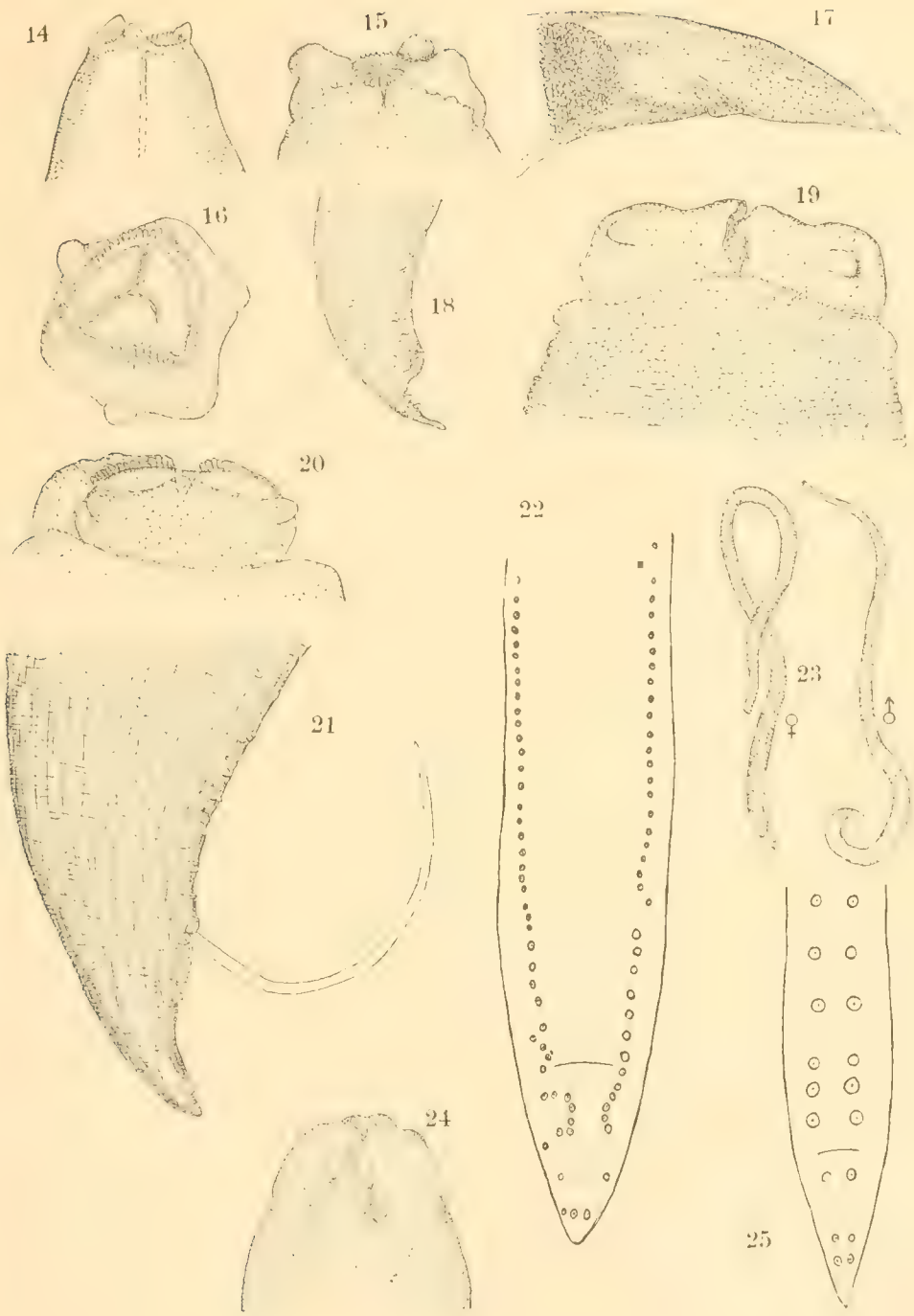


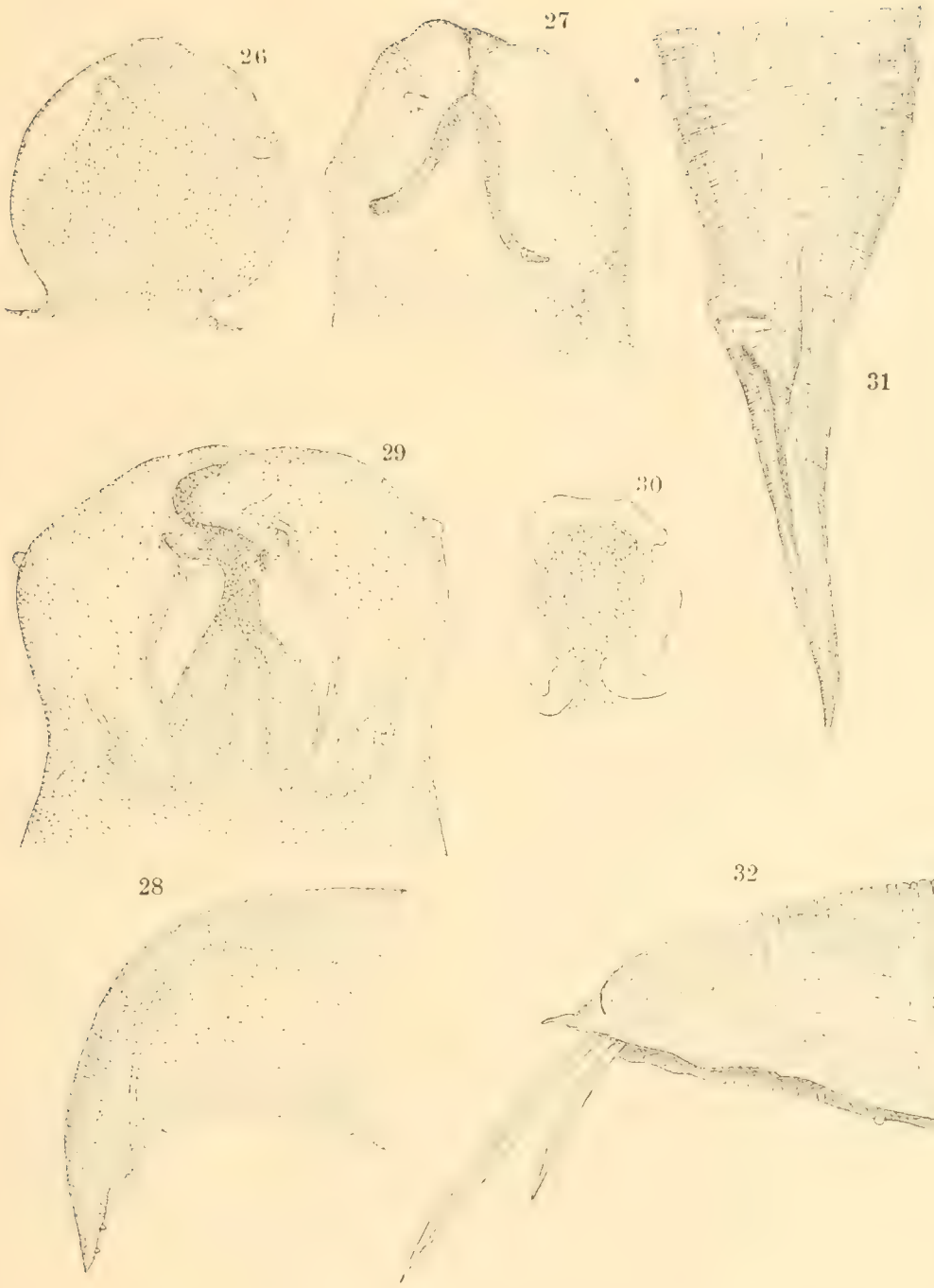


1. Transverse section of dorsal region of young herring (*Clupea harengus*) with cysts containing sporozoa. 32. *m*, Muscular tissue, *sp*, cysts containing sporozoa. *v*, vertebra.
2. Transverse section showing two small cysts, one of them (*sp.'*) in the midst of a muscle fiber. × 400. *ct*, Connective tissue with sporozoa.
3. Isolated sporozoa, different views and enlargements, Inc.
4. Piece of intestine of *Pseudopleuronectes americanus*, serous coat covered with cysts due to sporospermia. 2.
5. Protozoa found in intestinal canal of *Dasyatis centrura*. × 700.

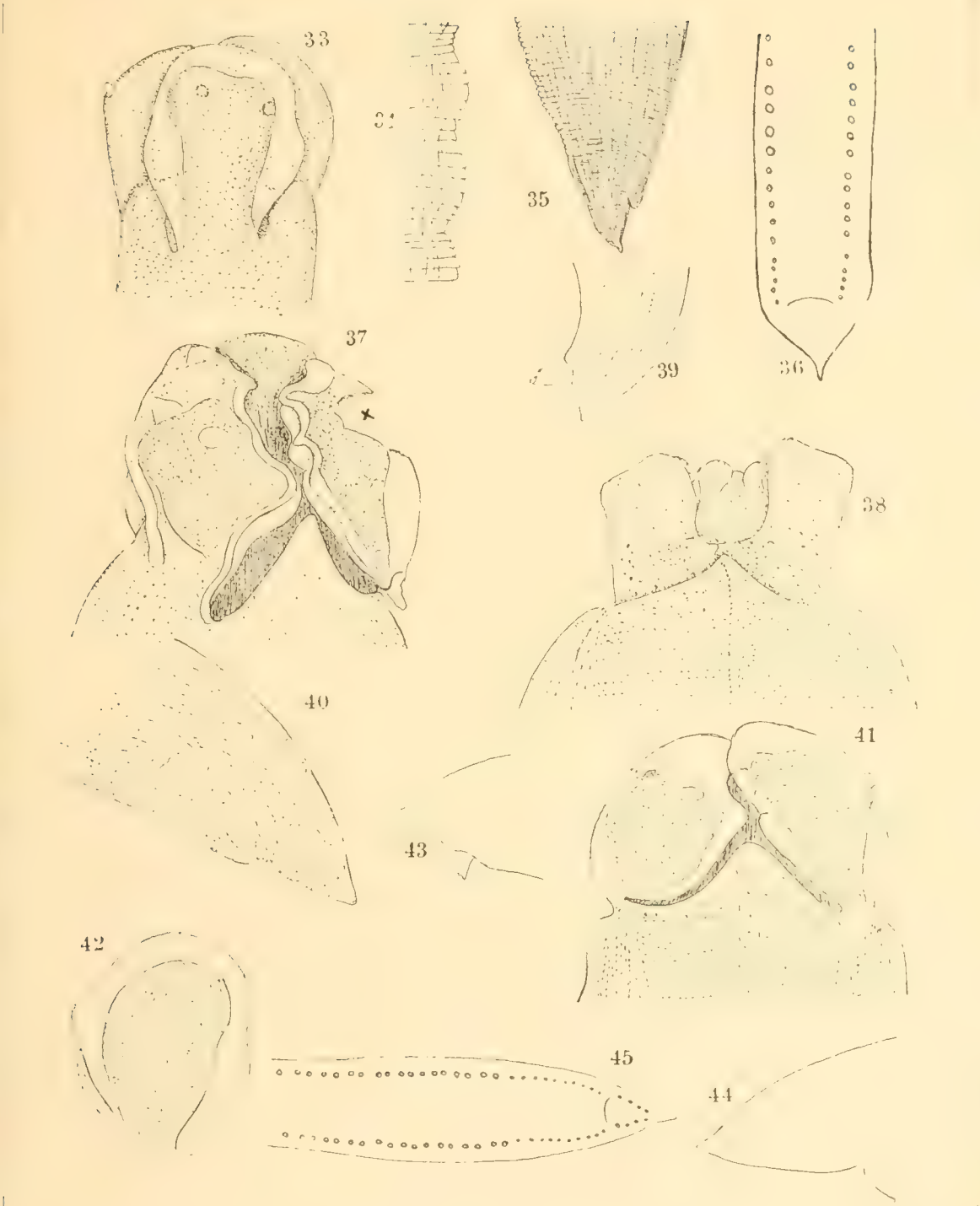
6. *Echinorhynchus* sp. (*a*), from *Lopholatilus chamæleonticeps*. × 46.
7. Proboscis of same. × 180.
8. *Echinorhynchus* sp. (*b*), from same host. × 65.
9. Proboscis of same, near apex. × 400.
10. Proboscis of same, near base. × 400.
11. *Echinorhynchus fusiformis* Zeder (?), from *Opsanus tau*. × 65.
a, Hooks of same. × 400.
12. *Echinorhynchus proteus* Westrumb, from *Cynoscion regalis*, longitudinal section of head and neck perforating intestinal wall of host. The mucous membrane (*mm*) is continuous over the head of the parasite. × 20.
13. Section passing somewhat diagonally through neck of another parasite, also penetrating intestinal wall of same host. × 65.
m, Muscular layer; *mm*, mucous membrane.



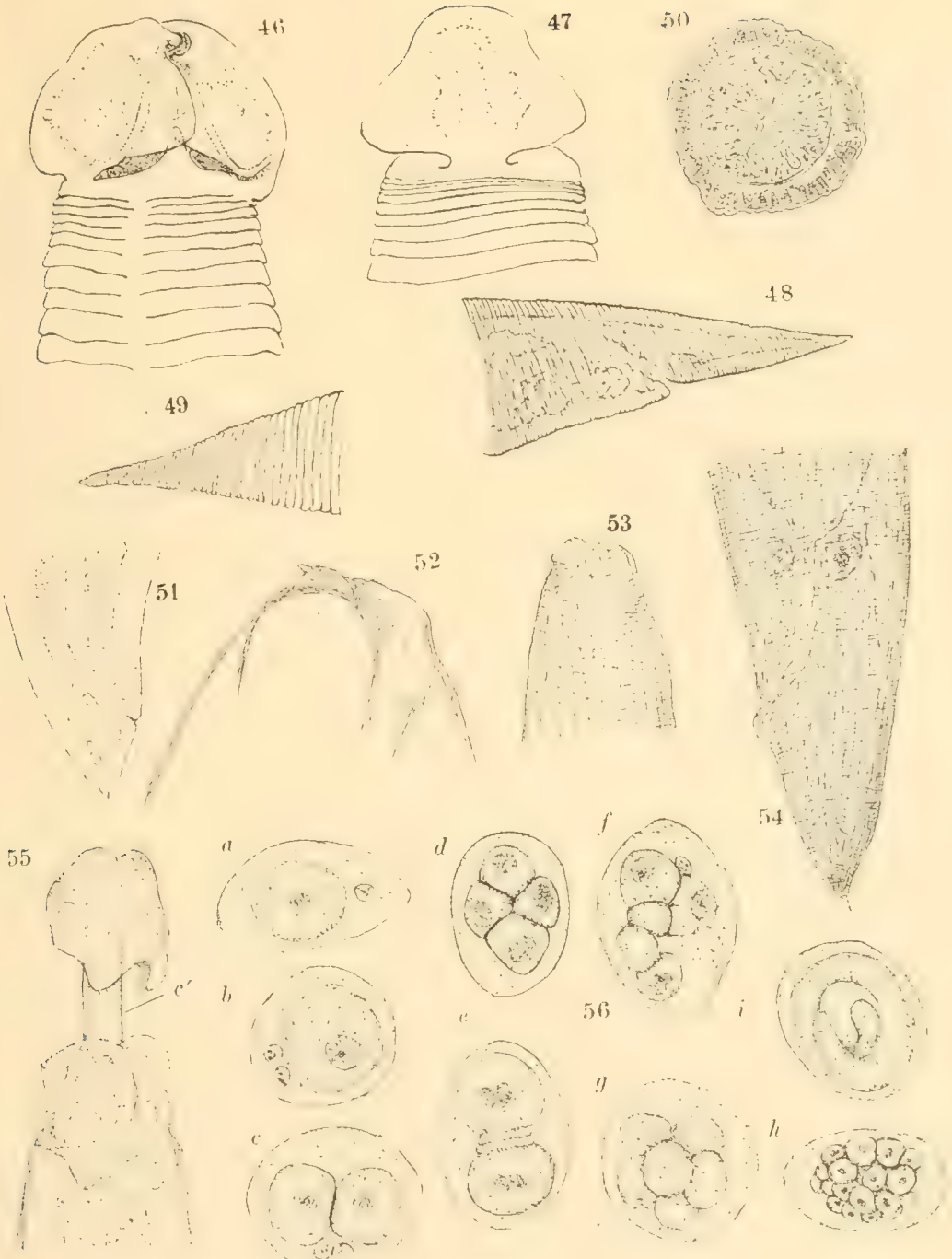
14. *Ascaris rotundata* Rudolphi, from *Raja crinacea*. Side view of head. × 300.
15. Another view of same. × 400.
16. Front view of different specimen from above. × 400.
17. Posterior end of female. × 65.
18. Posterior end of male. × 65.
19. *Ascaris brevicapitata* sp. nov., from *Galeocerdo tigrinus*. Ventral view of head. × 300.
20. Upper lip of same. × 300.
21. Side view of posterior end. × 300.
22. Diagram showing arrangement of anal papillæ so far as could be made out.
23. *Ascaris linstowi* sp. nov. Male and female from *Nematonurus goodei*. × 2.
24. Ventral view of head of female. × 100.
25. Diagram showing arrangement of anal papillæ.



26. *Ascaris linstowi* sp. nov., continued. Upper lip. × 300.
27. Ventral view of head of male. × 300.
28. Lateral view of tail of male. × 65.
29. *Ascaris incurva* Rudolphi, from *Xiphias gladius*. Ventral view of head. × 300.
30. Upper lip of same. × 300.
31. Nearly ventral view of tail of female. × 10.
32. Tail of male, lateral view. × 65.

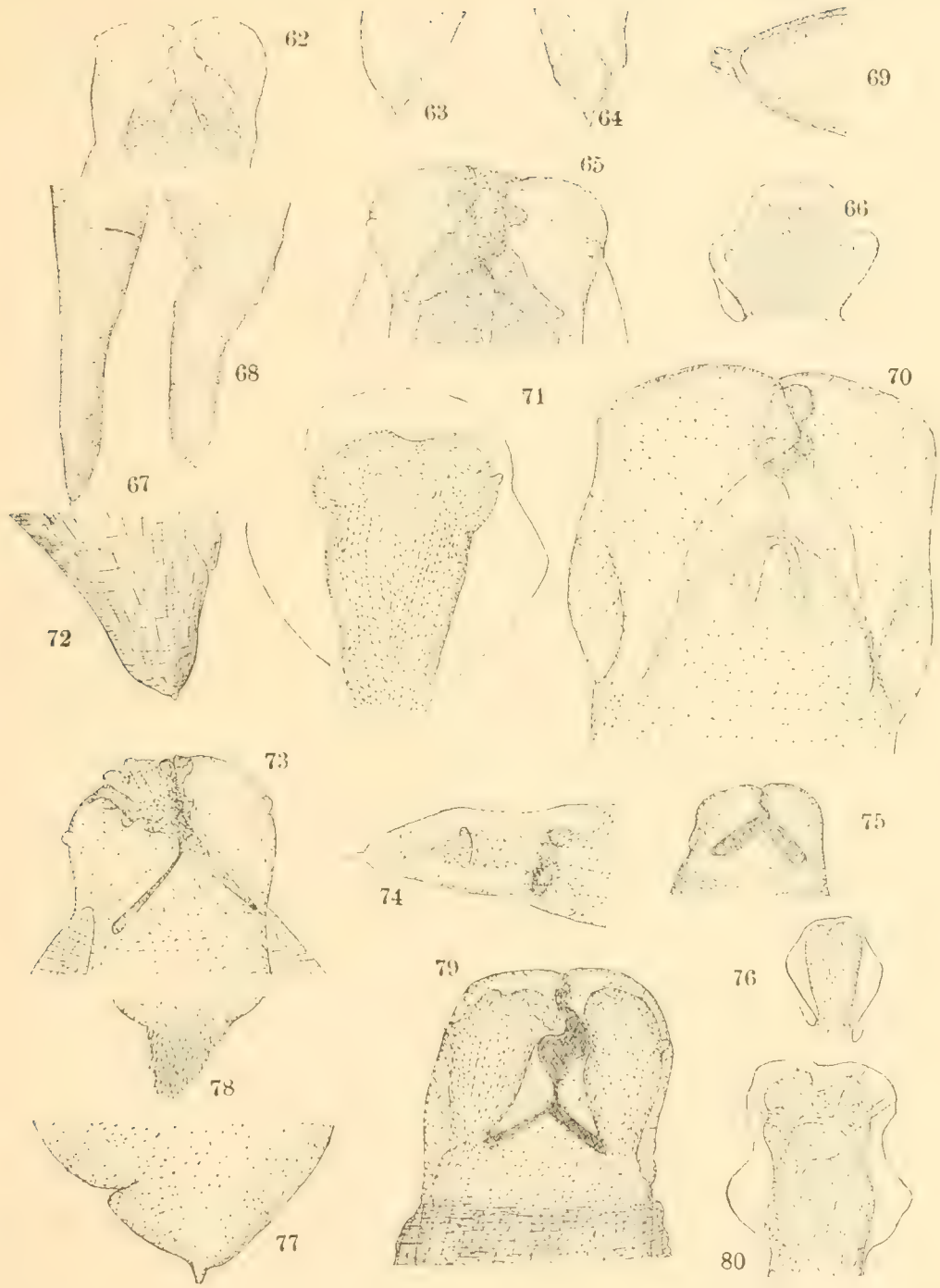


33. *Ascaris neglecta* Leidy, from *Chilomycterus schœpfi*. Head with upper lip. × 300.
34. Cuticle, optical section. × 400.
35. Lateral view of posterior end. × 65.
36. Plan of anal papillæ so far as made out.
37. *Ascaris* sp. from *Sayda sayda*. Ventral view of head of male. × 400. Cuticle missing at x.
38. Jaws of specimen from which the cuticle was entirely absent. × 300.
39. Lateral view of tail of male, spicules broken. × 65.
40. Lateral view of tail of female. × 65.
41. *Ascaris* sp. from *Pomolobus mediocris*. Ventral view of head. × 300.
42. Upper lip of male. × 300.
43. Lateral view of tail of male. × 100.
44. Same of female. × 100
45. Plan of anal papillæ.

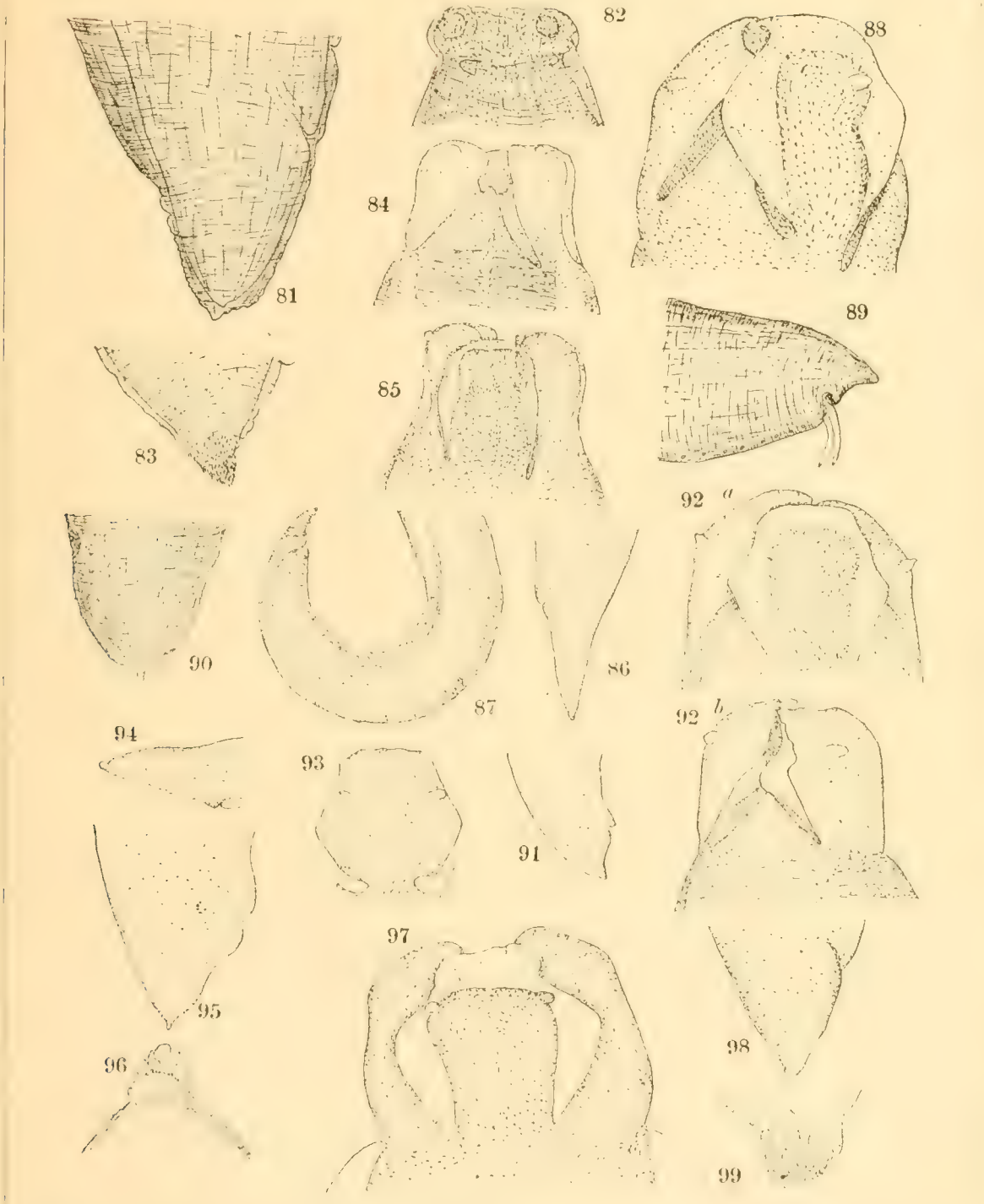


46. *Ascaris inquies* sp. nov., from *Rachycentron canadus*. Ventral view of head. × 220.
47. Upper lip. × 220.
48. Posterior end, lateral view. × 65.
49. Posterior extremity. × 220.
50. Transverse section through anterior end. × 100.
51. Immature nematode encapsuled on intestine of *Mola mola*. Head. × 700.
52. Posterior end, lateral view. × 100.
53. Immature nematode (*Ascaris*) from *Urophycis chuss*. Lateral view of head. × 160.
54. Lateral view of posterior end. × 100.
55. *Ascaris habena* Linton, young, from *Opsanus tau*. Anterior end showing the embryonic cuticle in the act of sloughing off. Sketched from life. Note that the cuticle of the pharynx *c'* is also separating. × 300.
56. *a-i*, Ova showing different stages of development, life. Forms like *e* and *f* noticed on different occasions. The embryo *i* was in an ovum which had been kept 2 days in sea water.

57. *Ascaris* (?) sp. from *Paralichthys dentatus*. Lateral view of female; life. *g*, Genital aperture; *i*, intestine; *o*, ovary; *ph*, pharynx. × 44.
58. Same from opposite side. × 68.
59. Two views (*a* and *b*) of head. × 400.
60. Posterior end, lateral view. × 400.
61. *a*, Spermatozoon; *b–e*, ova in different stages of segmentation; life.

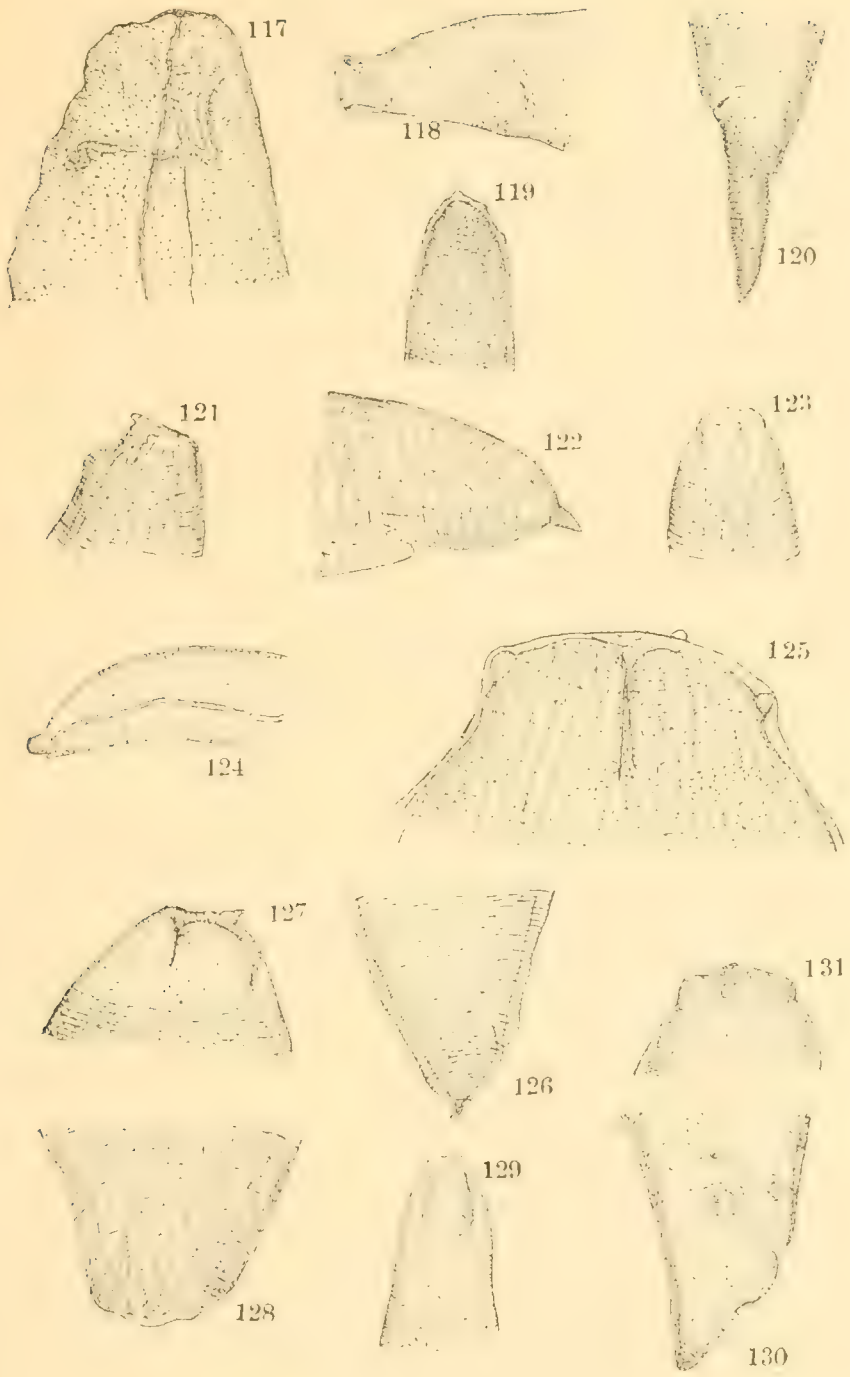


62. *Ascaris increscens* Molin, from stomach of *Coryphæna hippurus*. Ventral view of head of male. × 168.
63. Tail of same, spicules retracted. × 45.
64. Tail of specimen from *Lophius* [illegible].
65. *Ascaris* sp. from *Stenotomus chrysops*. Ventral view × 170.
66. Upper lip of same. × 170.
67. Posterior end, ventral view. × 45.
68. Posterior end, lateral view. × 45.
69. Tip of posterior end, optical section. [illegible]
70. *Ascaris* [illegible] from *Myrocephalus anens*. Ventral view of head. 225.
71. Upper lip. × 225.
72. Posterior end, lateral view. × 225.
[illegible]. *Ascaris* sp. from *Scomber scomber*.
74. Posterior end, ventral view.
75. *Ascaris* sp. from *Phocis tenuis*.
76. Upper lip. × 50.
[illegible]. Posterior end, lateral view. × 50.
78. Extreme tip of tail. × 225.
[illegible]. *Ascaris* sp. from *Sciænops ocellatus*. Ventral view of head. 75
80. Upper lip. × 75.



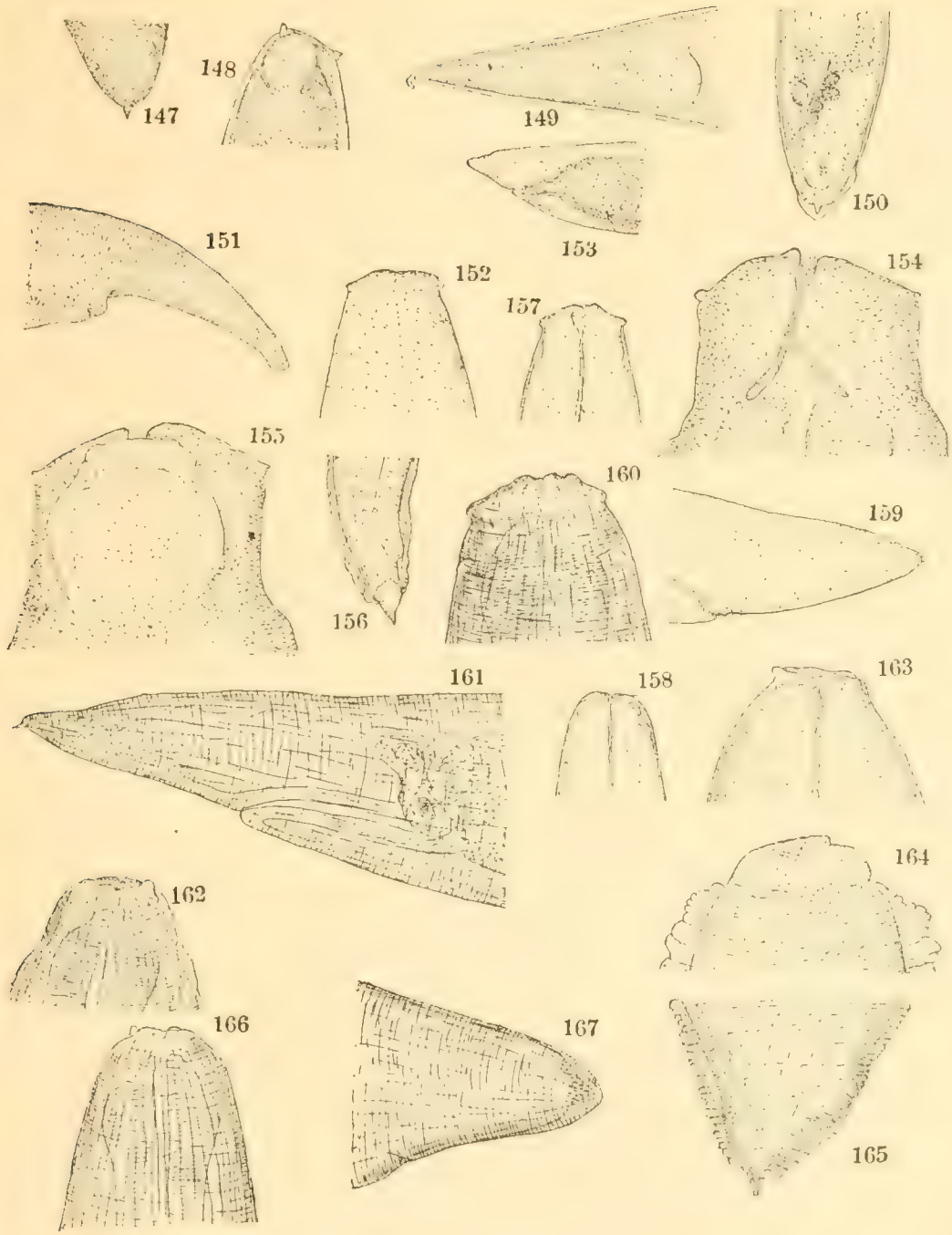
81. *Ascaris* sp. from *Sciurops ocellatus*, continued. Posterior end, lateral view. × 50.
82. Head of young specimen. × 225.
83. Extreme tip of tail highly magnified.
84. *Ascaris* sp. from *Cottunculus thomsonii*. Head of female. × 170.
85. Upper lip. × 170.
86. Posterio end, lateral view. × 27.
87. Posterior end of male, lateral view. × 22.
88. *Ascaris* sp. from *Pseudopleuronectes americanus*. View of head, highly magnified.
89. Posterior view of male, lateral view. × 50.
90. *Ascaris* sp. from *Mustelus canis*. Posterior end, lateral view. × 168.
91. *Ascaris* sp. from *Hemitripterus americanus*. Posterior end of female. × 60.
92*a*. Dorsal view of head. × 180.
92*b*. Ventral view of head. × 180.
93. Upper lip of same. × 180.
94. Posterior end of small specimen. × 60.
95. *Ascaris* sp. (probably same species as foregoing) from *Glyptocephalus cynoglossus*. Posterior end. × 42.
96. Extreme tip of tail. × 210.
97. *Ascaris* sp. from *Microgadus tomcod*. Dorsal view of head. × 225.
98. Posterior end, lateral view. × 75.
99. Extreme tip of same. × 300.

100. *Ascaris* sp. from *Pseudotomus saltatrix*. Lateral view of head. × 225.
101. Dorsal view of head. × 225.
102. Posterior end, lateral view. × 50.
103. Extreme posterior tip. × 225.
104. Anal glands, optical section. × 225. *i*, Intestine; *gl*, glands; *r*, rectum.
105. Head of younger specimen than the foregoing. × 50.
106. Posterior end. × 50.
107. *Ascaris* sp. from *Cynoscion regalis*. Head. × 75.
108. Posterior end. × 225.
109. Posterior end of a specimen from another lot. × 170.
110. *Ascaris* sp. from *Stenotomus chrysops*. Head. × 75.
111. Posterior end of same. × 75.
112. Extreme posterior end. × 225.
113. Head of specimen from another lot. × 170.
114. Posterior end. × 170.
115. Head of another specimen, removed from capsule on peritoneum. The embryonic cuticle is broken, showing the rudimentary jaws. × 225.
116. Posterior end. × 75.

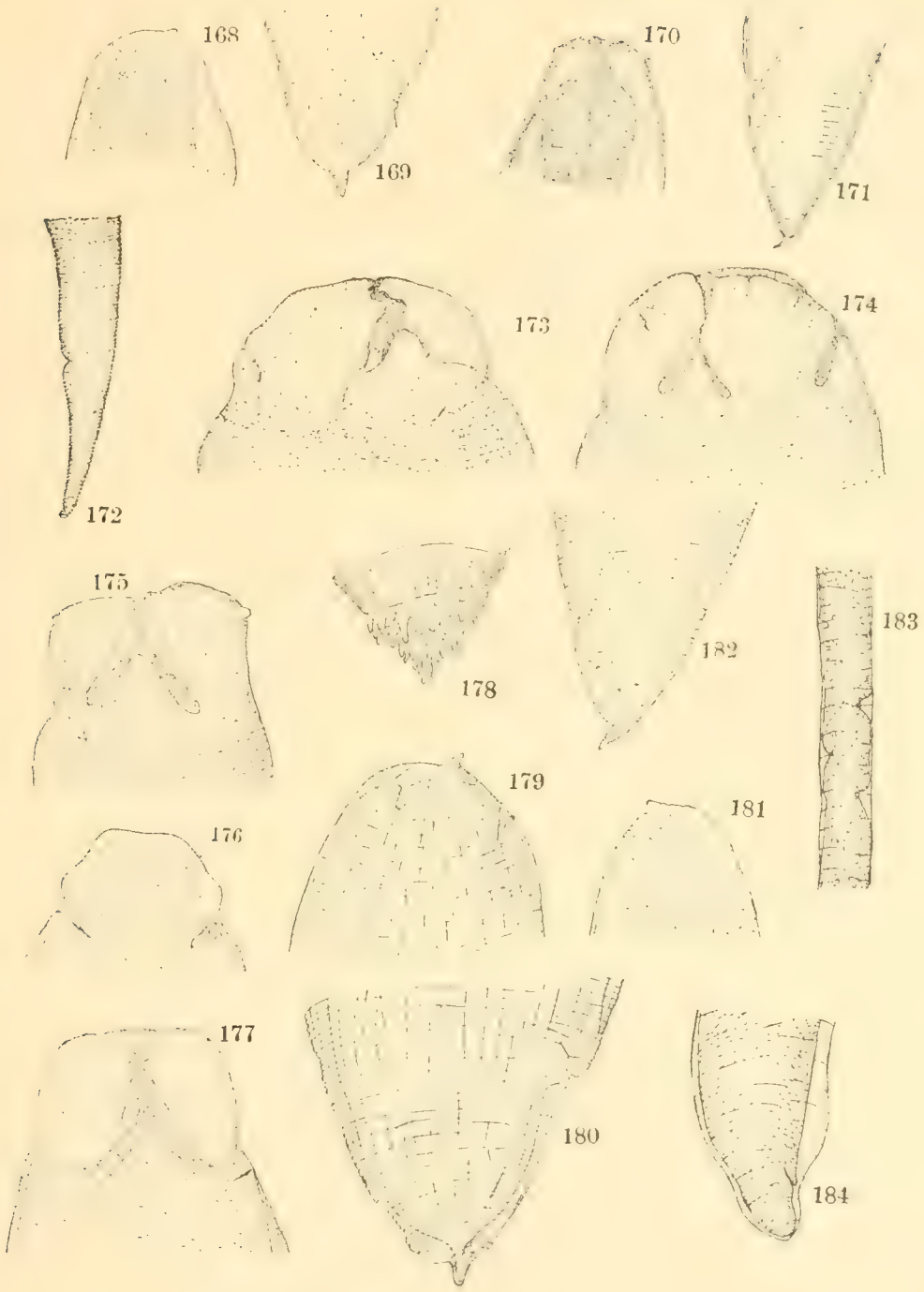


117. *Immature nematodes* (*Ascaris*) from *Stenotomus chrysops*, continued. Head of specimen from Charleston, S. C. × 170.
118. Posterior end. × 170.
119. Anterior end of specimen from another lot. × 225.
120. Posterior end of same. × 225.
121. *Ascaris* sp., immature, from *Lagocephalus lævigatus*. Head. × 225.
122. Posterior end. × 225.
123. *Ascaris* sp., immature, from *Lopholatilus chamæleonticeps*. Head. × 150.
124. Posterior end. × 150.
125. *Ascaris* sp. from *Anguilla chrysypa*. Head. × 225.
126. Posterior end. × 150.
127. *Ascaris* sp., immature, from *Carcharias littoralis*. Head. × 225.
128. Posterior end, lateral view. × 225.
129. Head of specimen from another lot. × 30.
130. Posterior end. × 30.
131. *Ascaris* sp. from *Salmo salar*. Head. × 150.

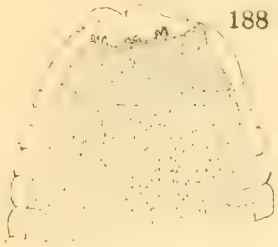
132. *Immature nematode* (*Ascaris*) from *Rhombus lobocanthus*. Head. × 225.
133. Posterior end. × 225.
134. *Immature nematode* (*Ascaris*) from *Scorpæna cacopsis*. Head. × 225.
135. Posterior end. × 50.
136. Upper lip of older specimen from another lot. × 225.
137. Posterior end. × 50.
138. *Ascaris* sp. from *Alosa sapidissima*. Head, ventral view. 200.
NOTE.—The specimens in this lot were somewhat distorted, the alcohol having evaporated from them.
139. Another view of head of a different specimen from the foregoing. × 200.
140. *Ascaris* sp. from *Lobotes surinamensis*. Head. × 225.
141. Upper lip. × 225.
142. Posterior end, lateral view. × 225.
143. *Ascaris* sp., immature, from *Paralichthys dentatus*. Head. × 225. *c*, Embryonic cuticle; *il*, interlip; *l*, lip.
144. Posterior end, lateral view. × 75.
145. Extreme posterior tip. × 225.
146. Head of specimen from another lot, younger stage. × 225.



147. *Ascaris* sp. from *Paralichthys dentatus*, continued. Posterior end of specimen shown in figure 146. × 75.
148. Head of specimen from another lot. × 225.
149. Posterior end of same. × 225.
150. Posterior end of specimen from another lot. × 75.
151. Posterior end of another from a different lot. × 225.
152. *Ascaris* sp., immature, from *Paralichthys oblongus*. Head. × 165.
153. Posterior end, lateral view. × 45.
154. *Ascaris* sp., immature, from *Bothus maculatus*. Lateral view of head. × 210.
155. Dorsal view of head. × 210.
156. Posterior end. × 24.
157. *Ascaris* sp., immature, from *Hemitripterus americanus*. Head. × 150.
158. Head of younger specimen. × 150.
159. Posterior end of same. × 150.
160. *Ascaris* sp. from *Merluccius bilinearis*. Head. × 225.
161. Posterior end. × 130.
162. Head of specimen from another lot. × 225.
163. *Ascaris* sp. from *Antimora viola*. Head. × 170.
164. Head of another specimen. × 170.
165. Posterior end of same. × 170.
166. *Ascaris* sp. from *Phycis tenuis*. Head. × 225.
167. Posterior end. × 225.



168. *Ascaris* sp. from *Menticirrus saxatilis*. Head. × 170.
169. Posterior end. × 170.
170. Head of specimen from another lot. × 170.
171. Posterior end of same. × 170.
172. *Ascaris* sp. from *Scomberomorus maculatus*. Posterior end. × 24.
173. *Ascari* sp. from *Macrourus bairdii*. Head. × 225.
174. Opposite side of head of same specimen. × 225.
175. Head of older specimen from another lot. × 170.
176. Upper lip of same, somewhat foreshortened. × 185.
177. Head of another specimen from same lot. × 210.
178. Tip of posterior end of same. × 375.
179. *Ascaris* sp. from *Lophius piscatorius*. Head. ×
180. Posterior end. ×
181. *Ascaris* sp. from *Scomber scombrus*. Head. × 180.
182. Posterior end. × 180.
183. *Ascaris* sp. from *[illegible] grata zygaena*. Portion of body. × 60.
184. Posterior end. × 56.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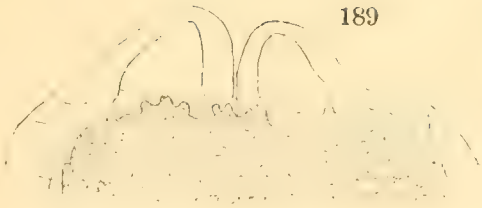
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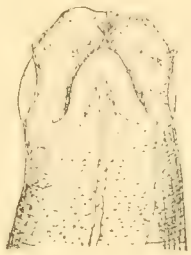
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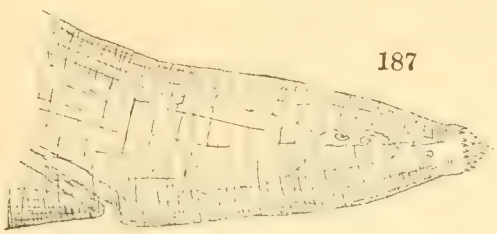
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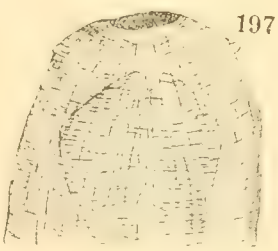
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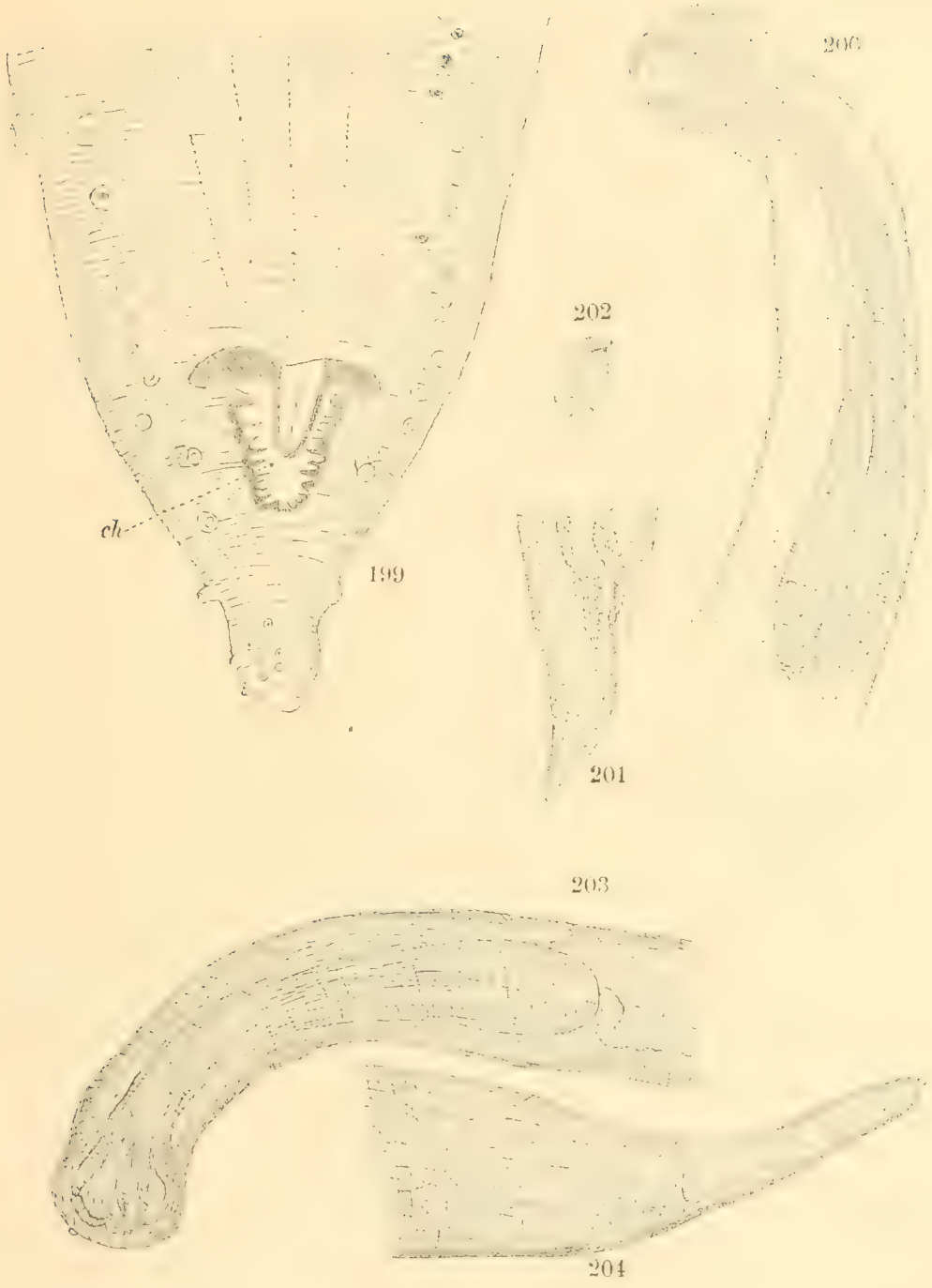
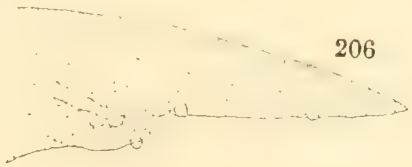
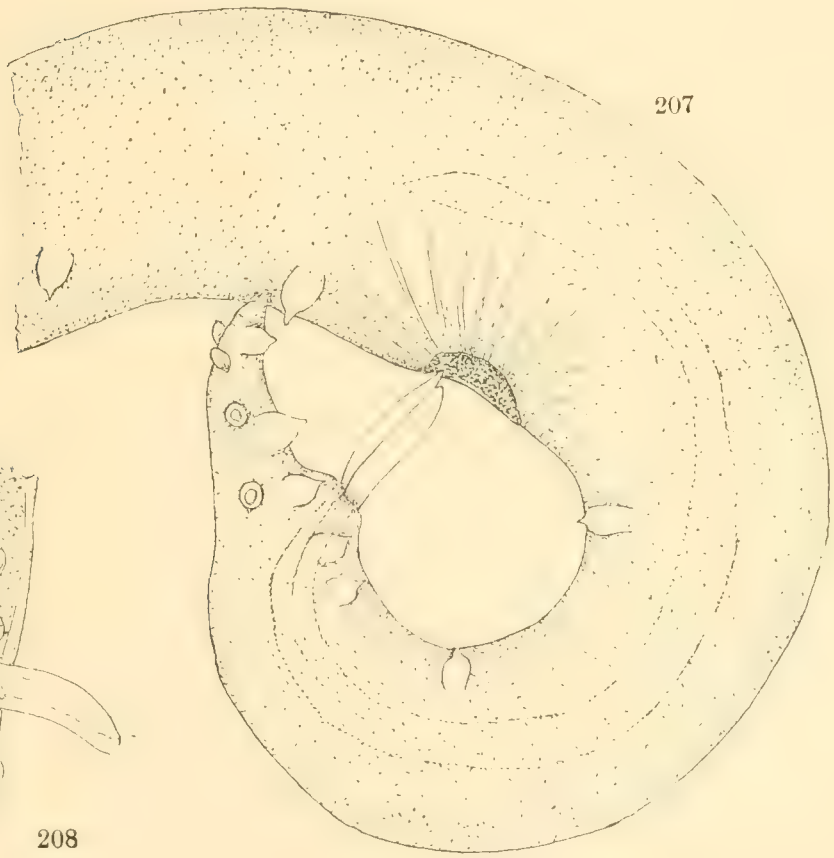
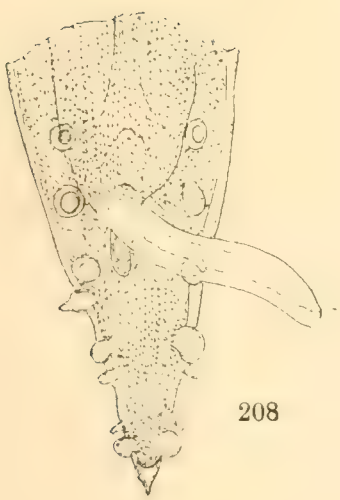
188. *Ascaris*, sp. immature, from *Lophius piscatorius*. Ventral view of head. × 300.
189. Upper lip. × 300.
190. Posterior end, lateral view. × 300.
191. *Filaria rubra* Leidy, from *Centropristes striatus*. Lateral view of head. × 75.
185. Optical section of same. × 200.
186. Opposite side of same. × 200.
187. Posterior end. × 200.
192. *Filaria serrata* sp. nov., from *Phycis tenuis*. Head and anterior end of female. × 300.
193. Head of male. × 300.
194. Posterior end of same, showing longitudinal serrate rows of plates. × 240.
195. Copulatory spines. × 240.
196. Plan of anal papillæ.
197. *Spiroptera pectinifer* sp. nov., from *Sphyræna zygæna*. Head of male. × 300.
198. Posterior end of same, lateral view. × 65.



199. *Spiroptera pectinifer* sp. nov., continued. Ventral view of posterior end of male. × 300. *ch*, Chitinous toothed plate.
NOTE.—There were four more groups of three papillæ each seen on the left side anterior to those shown in the figure.
200. *Dacnitis sphærocephala* Dujardin, from *Acipenser sturio*. Anterior end, optical section. × 65.
201. Posterior end. × 65.
202. Embryo sketched in uterus. × 300.
203. *Dacnitis hians* Dujardin, from *Leptocephalus conger*. Lateral view of head, optical section. × 100.
204. Posterior ventral view of same. × 100.

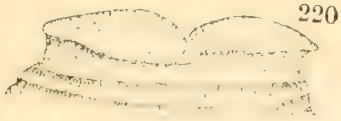


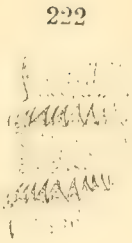


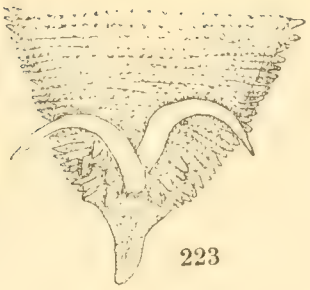


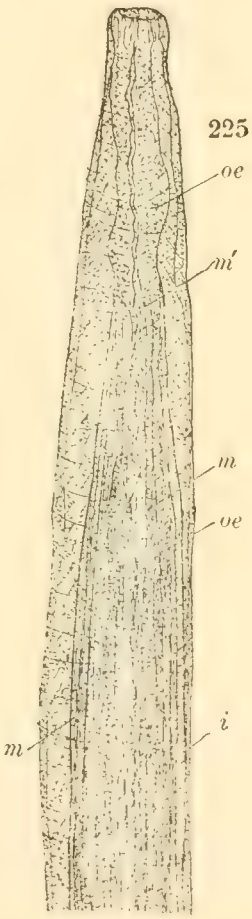
205. *Cucullanus globosus* Zeder, from *Lophius piscatorius*. Posterior end of male. × 65.
206. Lateral view of posterior end of male from *Gadus callarias*. × 200.
207. *Cucullanus* sp. from *Fundulus heteroclitus*. Posterior end of male, lateral view; life. × 300.
208. Ventral view of posterior extremity. × 330.

209. *Ichthyonema globiceps* Rudolphi. Anterior end of specimen from *Lobotes surinamensis*, from life; sketched by Margaret B. Linton. × 22.
210. Young individual escaped from uterus of foregoing. × 300.
211. Anterior end of specimen from *Pomatomus saltatrix*. × 65.
c, Young worms in body cavity; *i*, intestine; *oe*, œsophagus; *or*, ovary.
212. Pharynx. × 300.
213. Junction of œsophagus and intestine, optical section. × 300.
c, *c*, *c*, Cells in wall of œsophageal valve; *i*, wall of intestine; *oe*, œsophagus.
214. Posterior end. × 26.
215. Portion of intestinal wall near posterior end, showing characteristic reticulation. × 65.
216. Optical section of middle of body of a specimen from *Tarpon atlanticus*. × 65. *or*, Outer, and *or'*, inner, fold of uterus; *i*, intestine.
217. Ova; *a* from outer, *b* from inner, fold of uterus. (See fig. 216.) × 300.
218. *Ichthyonema* sp. from *Chætodipterus faber*; *oe*, œsophagus; *or*, ovary. Anterior end. × 100.
219. Posterior end of same. × 100.

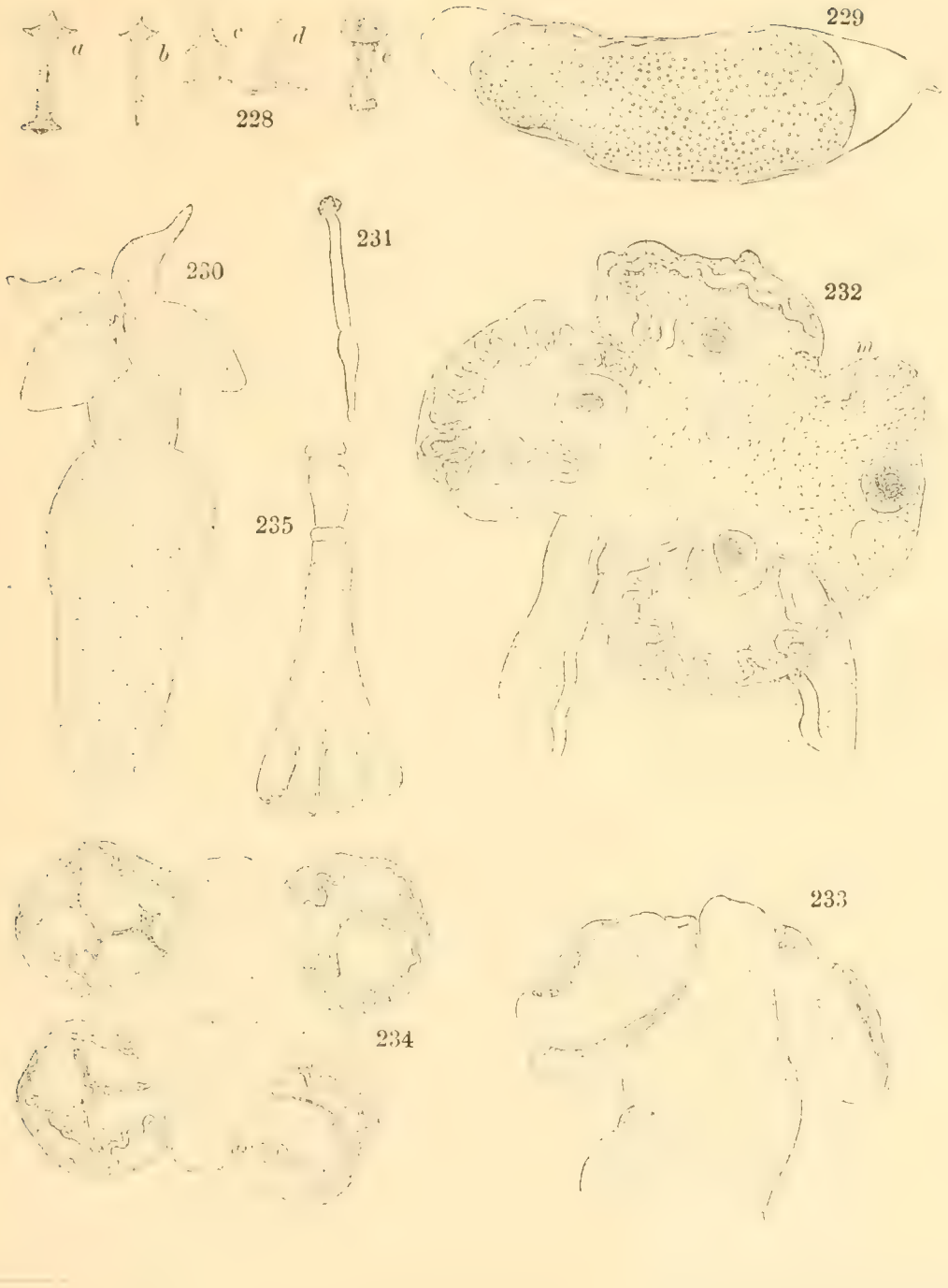








220. *Lecanocephalus annulatus* Molin, from *Roccus lineatus*. Head, dorsal view. × 300.
221. Head, ventral view. × 300.
222. Portion of two dentigerous rows, near middle of body. × 300.
223. Posterior end, ventral view, showing spicules and papillæ. × 300.
224. Undetermined nematode from stomach of *Macrourus bairdii*. × 12.
225. Œsophageal region of a specimen with anterior end slightly retracted. × 65. *m'*, Beginning of muscular sheath; *m*, *m*, continuation of same posteriorly; *i*, intestine; *oe*, œsophagus.
226. Anterior end of specimen with spines. × 200.
227. Genital aperture of female. × 300.



228. Cestode larva from intestine of *Decapterus macarellus;* *a* to *d*, sketched from life; *e*, alcoholic. These different forms were assumed by the larva in rapid succession, and by such contractions a progressive movement was effected.
The top of the figure in each case is the anterior end.

229. Blastocyst in cyst from body cavity of *Clupea harengus*. *Rhynchobothrium* sp. × 20.

230. Larval cestode from a squid (*Loligo pealii*) in stomach of *Cynoscion regalis;* life. × 65.
At the base of each petal-like bothrium there is a short conical process, sharp and hooklike, but of dense striated structure, like the hooks of *Thysanocephalum*. Beside each of these processes there is a circular organ like an auxiliary acetabulum, not seen in the living specimen, but visible when mounted in glycerine.

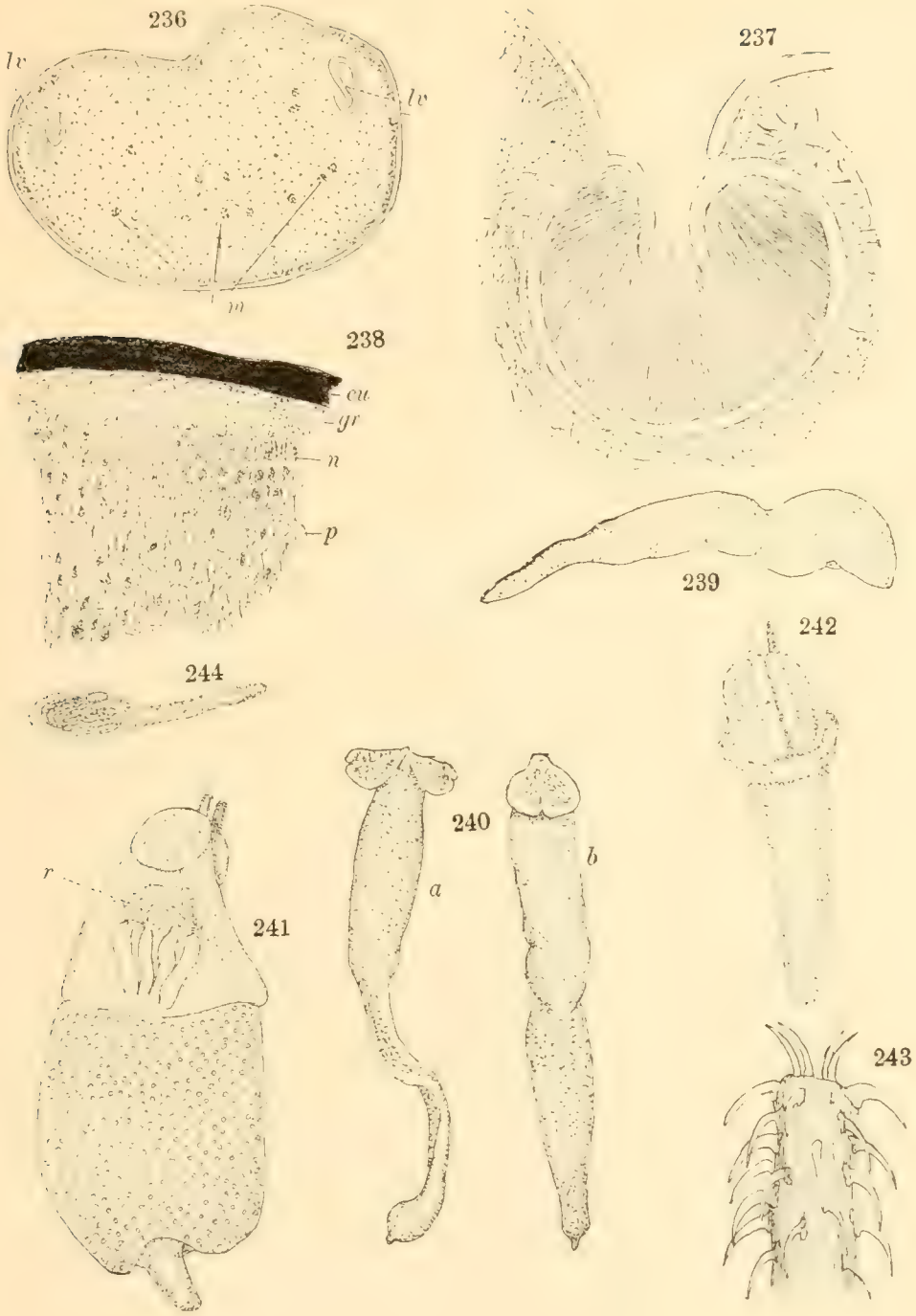
231. *Phyllobothrium* sp. from intestine of *Merluccius bilinearis;* life. × 1.

232. Head, much enlarged. *m*, Myzorhynchus.

233. Scolex of a cestode, which is probably a new genus, from intestine of *Lopholatilus chamaeleonticeps;* alcoholic. × 50.

234. Front view of same. × 70. (See also figs. 236–238.)

235. *Crossobothrium laciniatum* Linton, from *Carcharias littoralis*. Abnormal segment of young strobile. × 50.



236. New cestode from *Lopholatilus chamæleonticeps*, continued. Section of neck nearly transverse. × 70. *m*, Coarse longitudinal muscles; *lv*, lateral vessels.

237. Section showing portion of anterior disc with its acetabulum. × 400.

238. Section showing structure of body wall. *cu*, Structureless cuticle, not stained; *gr*, granular layer, *n*, nuclear layer; *p*, parenchyma, the nuclei are stained, the fibers unstained. × 700.

239. Blastocyst, probably *Rhynchobothrium speciosum* from *Coryphæna hippurus;* life. × 2.

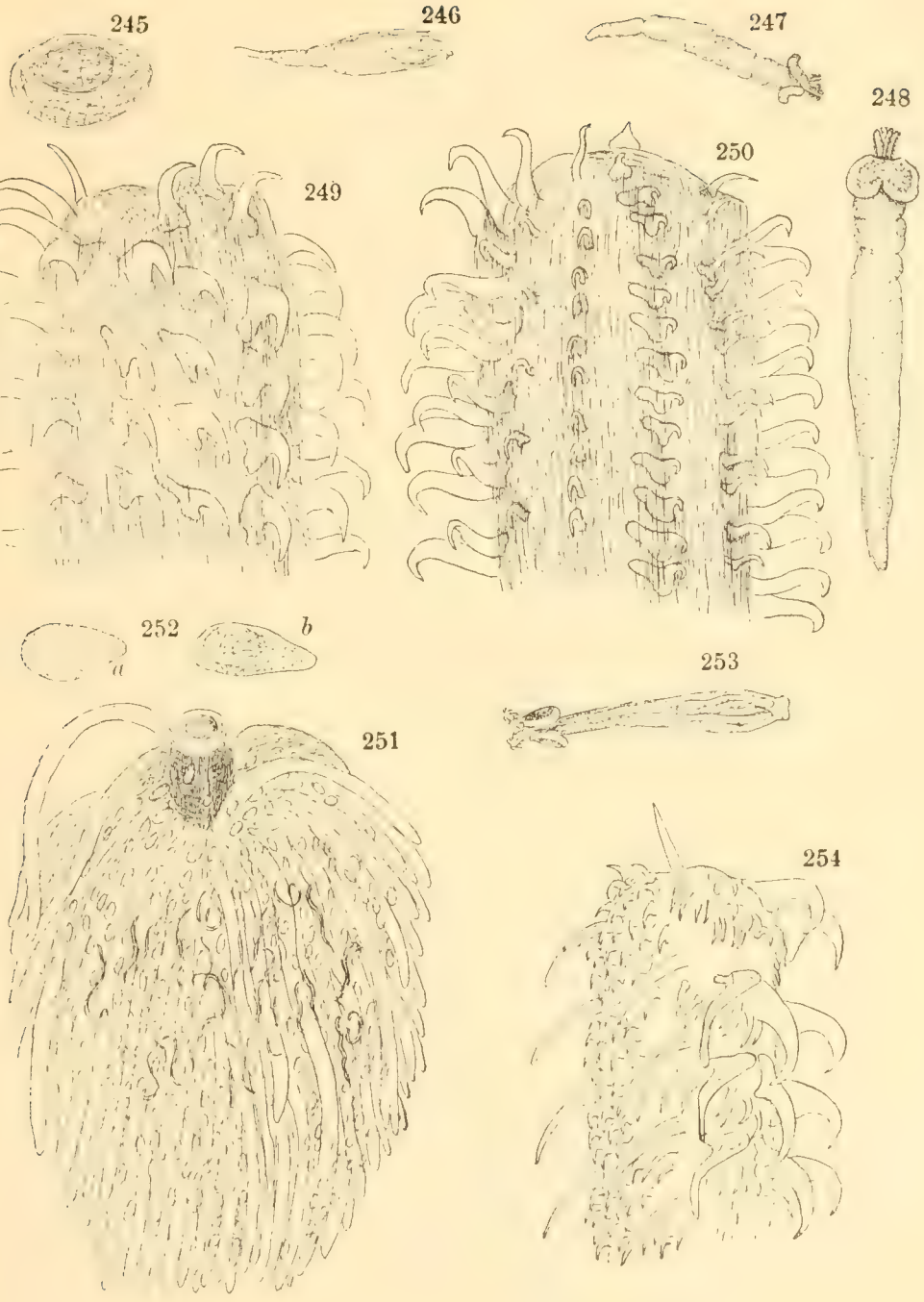
240. *a* and *b*. Two views of larva liberated from 115. × 6.

241. *Rhynchobothrium tumidulum* Linton; scolex from intestine of *Opsanus tau;* life. *r*, Red pigment patch. × 65.

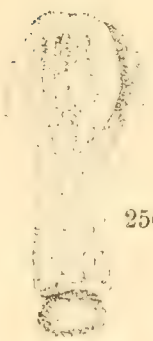
242. *Tetrarhynchus robustus* Linton; scolex from intestine of *Isurus dekayi;* life. × 22.

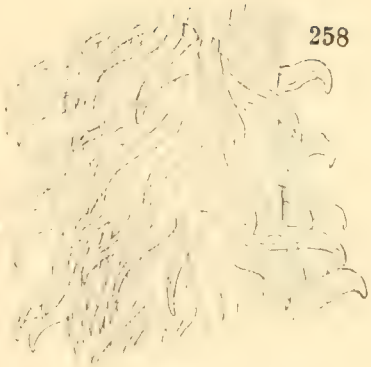
243. *Tetrarhynchus bisulcatus* Linton, from *Decapterus macarellus.* Proboscis. × 700.

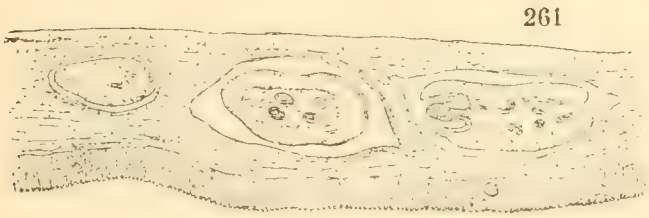
244. *Rhynchobothrium bulbifer* Linton, from cyst in muscles of back of *Scomber scombrus.* × 15.



245. *Rhynchobothrium* sp. Cyst from beneath serous coat of intestine of *Mola mola;* life. × 1.
246. Blastocyst liberated from cyst. × 1.
247, 248. Two views of larva from blastocyst.
249, 250. Opposite sides of proboscis near apex. × 300.
251. *Rhynchobothrium* sp. Pyloric cæca of *Merluccius bilinearis* with cysts and immature nematodes on serous coat. × 2.
252, *a* and *b*. Cysts, the latter slightly compressed to show the contained embryo. × 4.
253. Embryo liberated from blastocyst. × 18.
254. Proboscis of same. × 400.







255. *Rhynchobothrium* sp. Cyst from muscles of *Rhombus triacanthus*, compressed to show blastocyst and contained embryo; life. × 100. (See also fig. 265.)

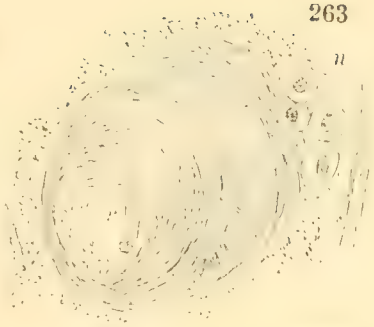
256, 256*a*. Two views of an embryo. × 300.

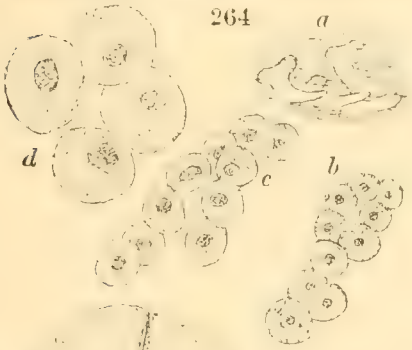
257–260. *Tetrarhynchus elongatus* Wagener, from liver of *Mola mola*. Proboscis. × 160.

259, near base; 260, base.

261. *Tetrarhynchus bisulcatus* Linton. Section of stomach wall of *Cynoscion regalis*, parasites encysted in submucosa. × 30.

262





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262. *Tetrarhynchus bisulcatus*, continued. Section of parasite, cut longitudinally, in submucous coat of stomach. × 50.

263. Transverse section through muscular bulb of proboscis. × 400. *n*, Nerve cells; *r*, retractor of proboscis.

264. *a*, Hooks in retracted proboscis of encysted parasite, × 800; *b*, *c*, groups of nerve cells lying beside contractile bulb, × 400; *d*, same, × 750.

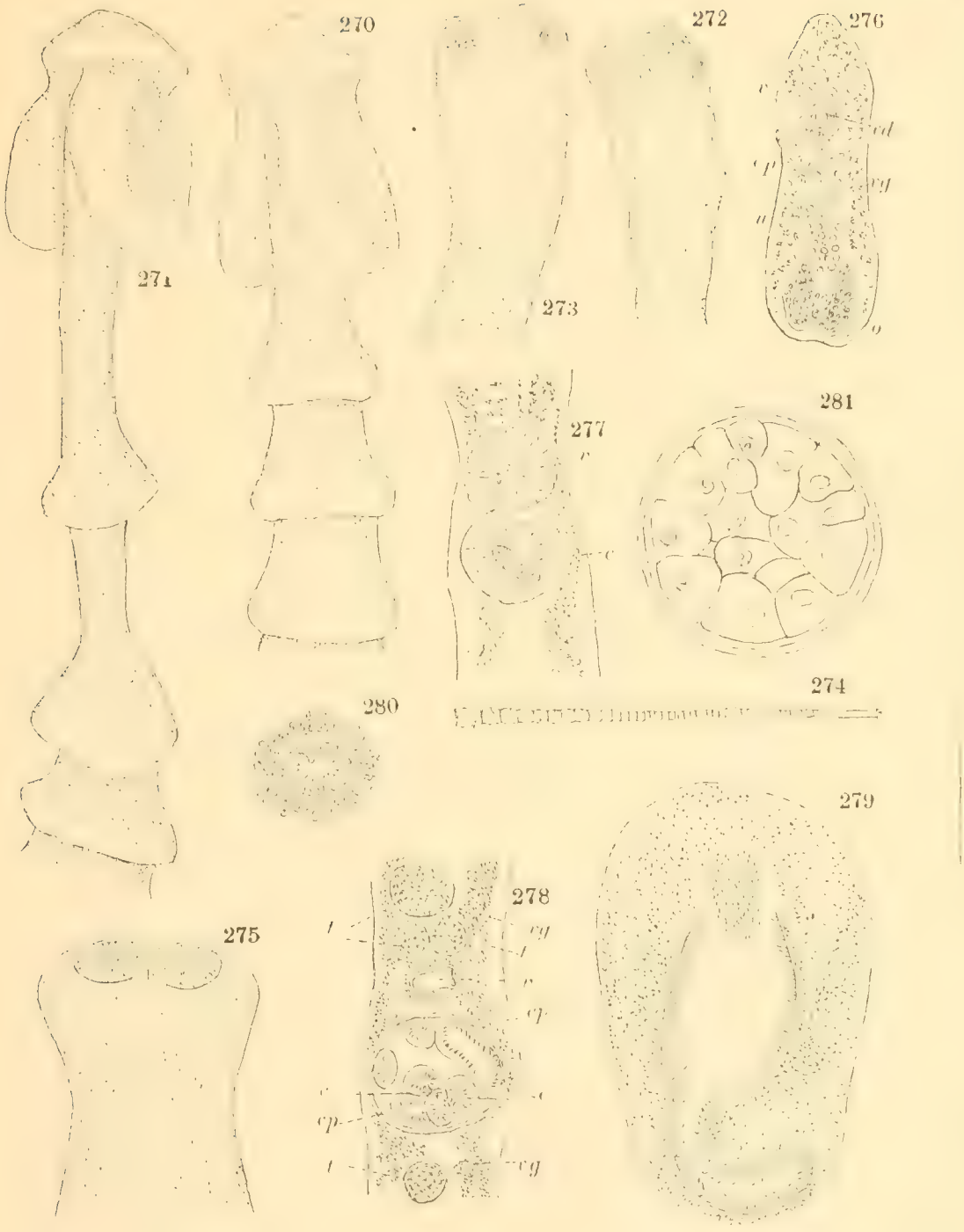
265. Transverse section of dorsal muscles of *Rhombustriacanthus* with cysts containing *Rhynchobothrium* sp. × 30. (See 255-256a.)

266. *Dibothrium crassiceps* Rudolphi, from intestine of *Merluccius bilinearis*. Marginal view of head. × 40.

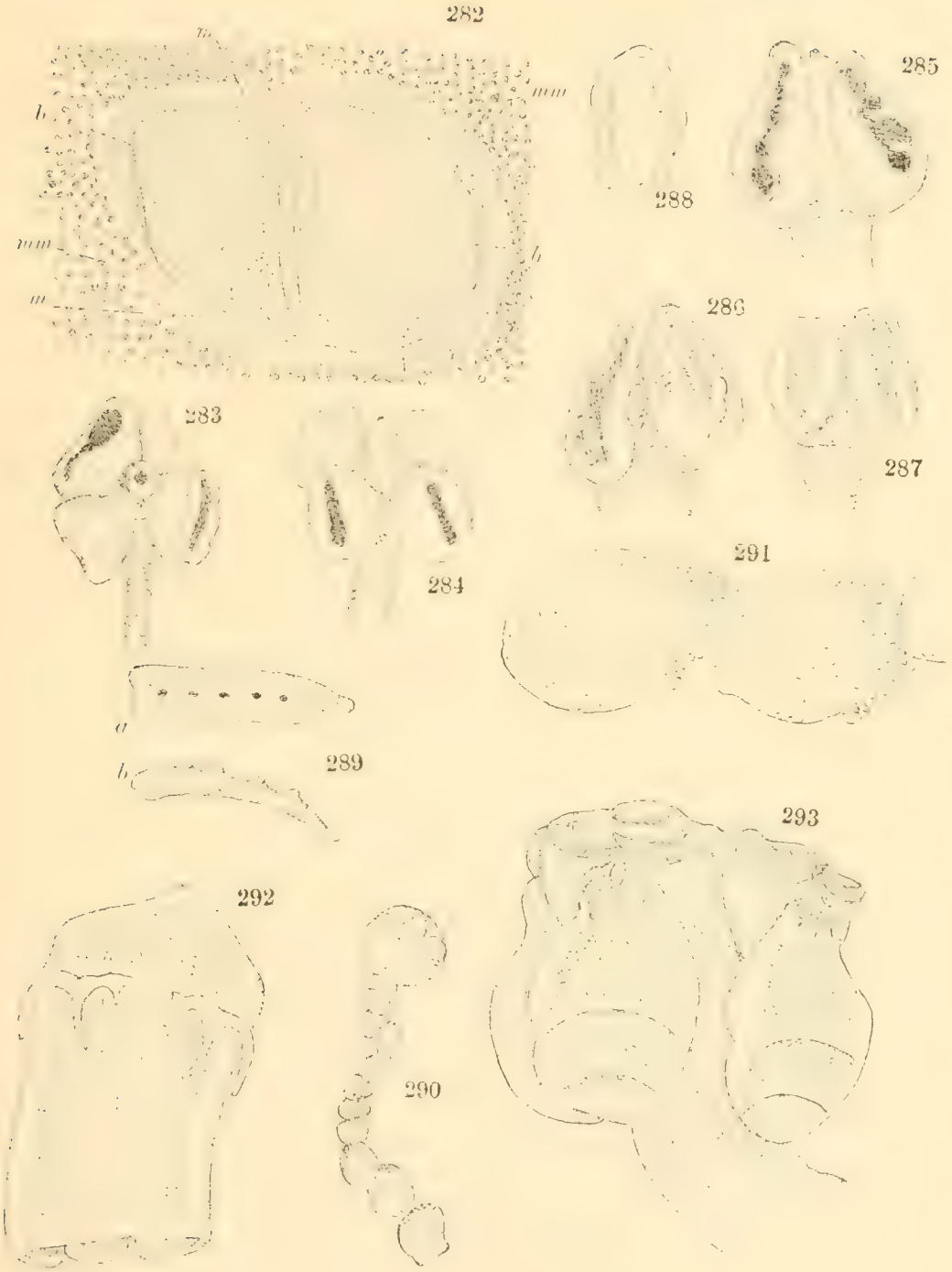
267. Lateral view of head. × 40.

268. Posterior end of strobile. × 40.

269. *Dibothrium angustatum* Rudolphi, from intestine of *Merluccius bilinearis*. *a*, Head, × 50; *b*, median segments, × 50; *c*, posterior segments, × 30.



270. *Dibothrium microcephalum* Rudolphi, from intestine of *Mola mola*. Head with anterior segments, normal; life. × 65.
271. Abnormal lengthening of anterior segments; life. × 65.
272. *Tænia* sp. from intestine of *Anguilla chrysypa*. Head. × 40.
273. Head of another specimen. × 50.
274. *Tænia* sp. from intestine of *Sphyrna zygæna*. × 2.
275. Head of same. × 65.
276. Posterior segment. *cp*, Cirrus pouch; *o*, ovary; *u*, uterus; *v*, vagina; *vg*, vitelline glands. × 8.
277. Sagittal section of segment. × 100. *c*, Cirrus; *v*, vagina.
278. Sagittal section through cirrus pouch. *c*, Cirrus; *cp*, cirrus pouch; *t*, testes; *v*, vagina; *vg*, vitelline glands. × 100.
279. Cirrus, from transverse section of segment. × 300.
280. Transverse section of cirrus, showing cells of prostate gland and spines on retracted cirrus. × 400.
281. Segmenting ovum, in uterus. × 300.



282. *Tænia* sp. continued. Section of mucous membrane of intestine with head of parasite. ×300. *m*, Lining of pit and plug between bothria, structureless; *b*, bothria covered with fine spines; *mm*, mucous membrane.

285. *Echeneibothrium* sp. (near *E. affine* Olsson) from intestine of *Rhinoptera bonasus;* front view of head. ×65

284. Lateral view of head of another specimen. ×65.

285–287. *Echeneibothrium* sp. from *Myliobatis freminvillei;* lateral view of heads of different individuals. ×65.

288. Plan of loculi on bothrium. ×65.

289. *Calliobothrium verticillatum* Rudolphi, from *Mustelus canis;* ripe segment with five apertures for discharge of ova. *a*, Flat surface of segment; *b*, marginal view.

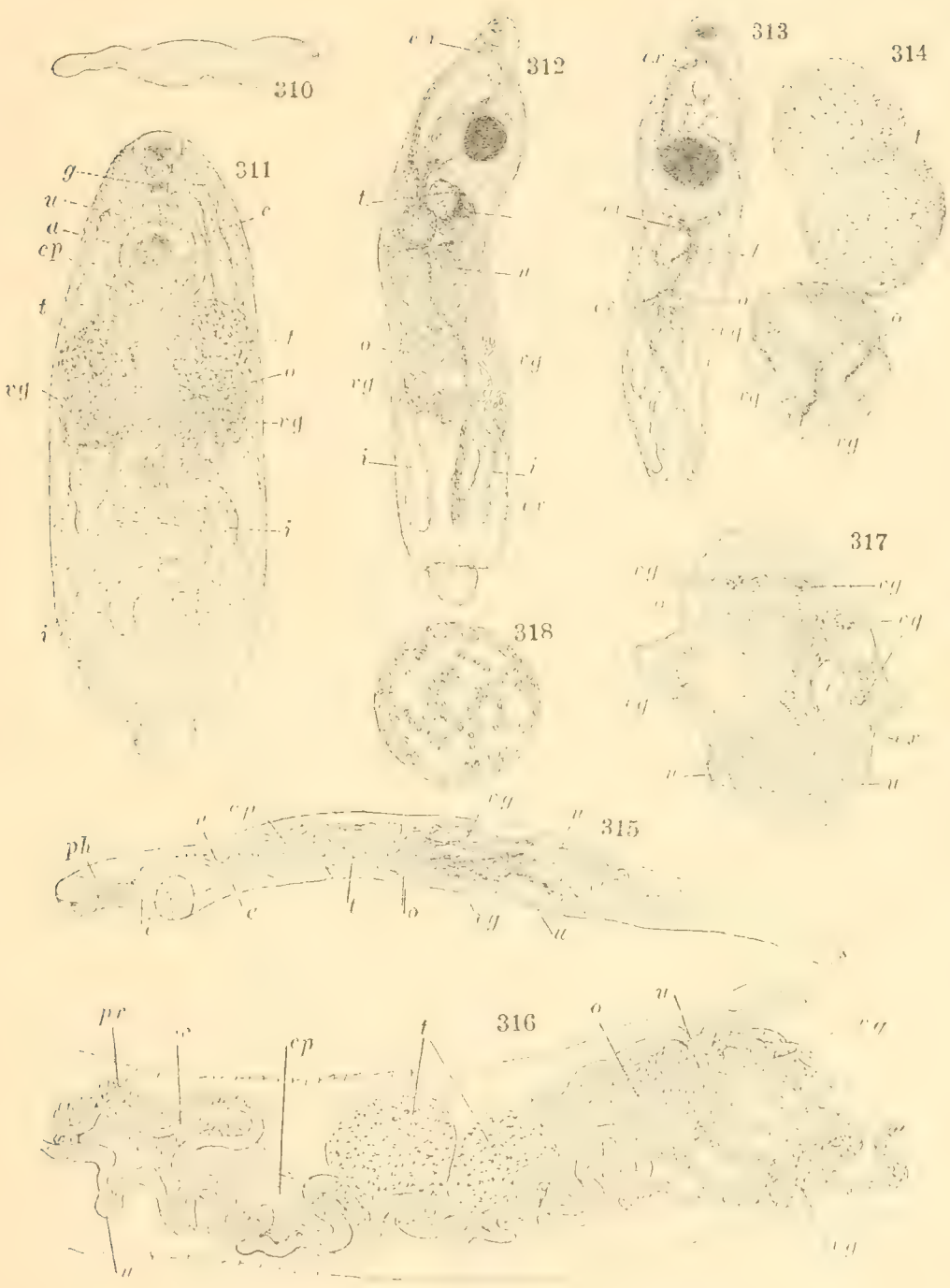
290. *Paratænia medusia* Linton, from *Dasyatis centrura*, strobile; life. ×160.

291. Posterior segments; life. ×300.

292. *Phoreiobothrium triloculatum* sp. nov. from *Carcharinus obscurus;* single bothrium, showing characteristic trilocular border. ×100.

293. *Acanthobothrium coronatum* Rudolphi, from *Raja lævis*. Lateral view of scolex. ×65.

294. *Thysanocephalum yidiculus* sp. nov. from *Isurus dekayi*. Strobile. × 46. *a*, Bothrium from another specimen.
295. Hook and adjacent part of bothrium. × 300.
296. *Hexacotyle thunni* De la Roche (?), from mouth of *Sarda sarda*. Ventral view. × 6.
297. Mouth. × 300.
298. Single sucker. × 100.
299, 300. *Microcotyle* sp. from gill filaments of *Pomatomus saltatrix*. Two individuals, alcoholic. × 12.
301. Anterior end, ventral view. × 220.
302. Portion of posterior part of body, ventral view, showing sucking discs. × 100.
303–305. Different views of suckers. × 100.
306. Ovum. × 240.
307. *Diplostomum* sp. in globular cysts in liver of *Fundulus heteroclitus*; section of cyst and longitudinal section of parasite. × 100.
308. Cysts in liver of *Roccus lineatus*. × 1.
309. Calculus from cyst, showing concentric structure. × 300.



310. *Distomum formatum* Rudolphi, from *Menidia notata;* lateral view, from life. × 3.

311. *Distomum* sp. from *Menticirrus saxatilis;* ventral view; life. *u*, Ventral sucker; *c*, cirrus; *cp*, cirrus pouch; *g*, genital aperture; *i*, intestine; *o*, ovary; *t*, testes; *ut*, uterus; *vg*, vitelline glands. × 40.

312. *Distomum appendiculatum* Rudolphi, from *Decapterus macarellus;* adult, ventral view. *ex*, Excretory vessel; *ut*, uterus. Other letters as in fig. 311. ×

313. Young, ventral view. Letters as in figs. 311, 312. × 46.

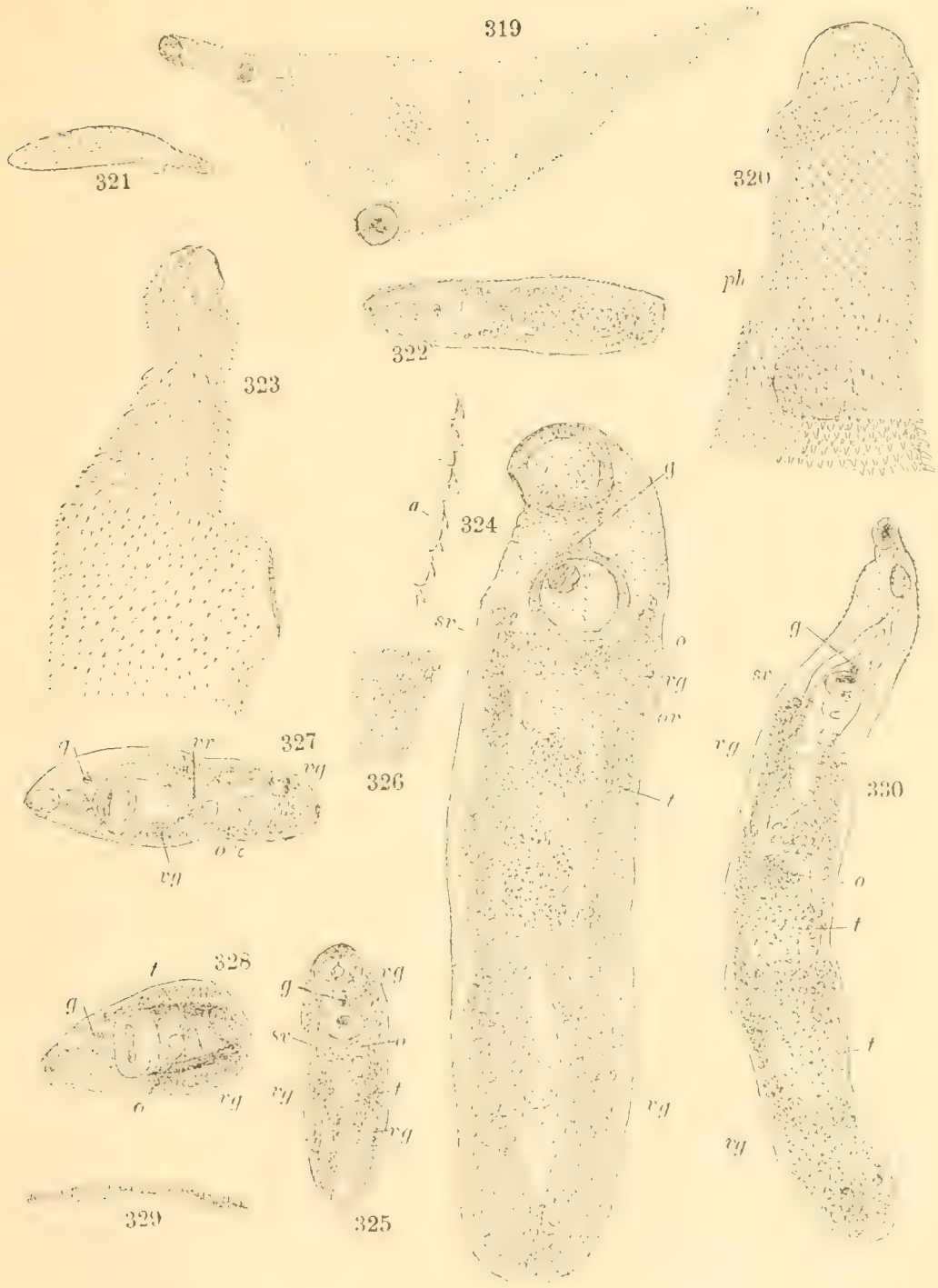
314. [illegible] ovary, and vitellaria of young. Letters as in fig. 311. × 220.

NOTE.—The vitellaria, which are deeply lobed in the young, appear to lose this character in the adult.

315. *Distomum guloseum* sp. nov. from *Rhombus triacanthus;* lateral [illegible]. *ph*, The long, cylindrical pharynx. Other letters as in figs. 311, [illegible].

316. [illegible] × 65. Letters as in [illegible]

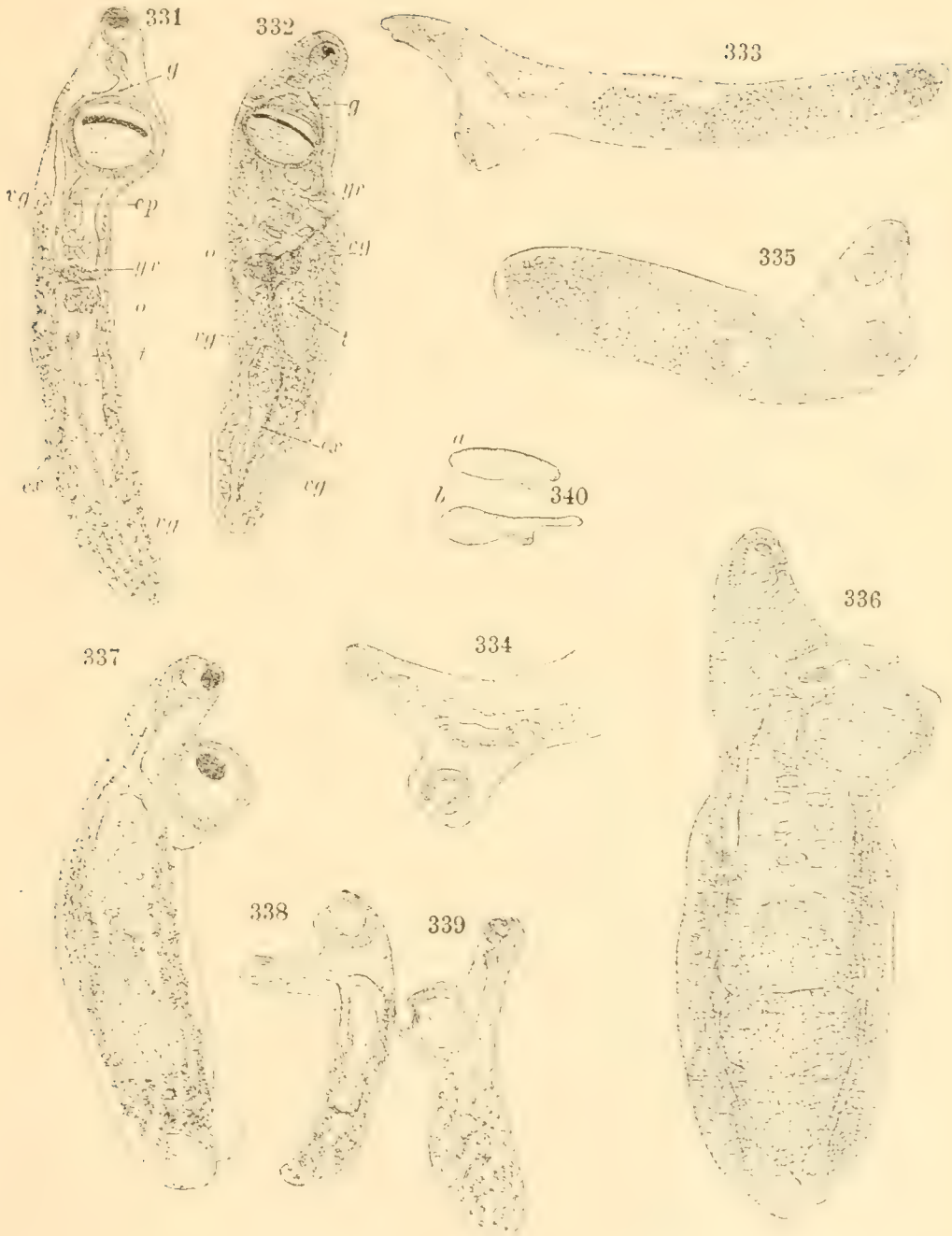
[illegible] *Bodotria pulex*, distomes encysted in cornea. × 2.



319. *Distomum* sp. from *Stolephorus brownii;* lateral view of mounted specimen. × 100.
320. Head and neck of same. × 400. *ph*, Pharynx.
321. *Distomum hispidum*, from *Physis leucas;* side view; alc. × 7.
322. Ventral view. × 14.
323. Anterior end, side view. × 65.

Undetermined distomes from Opsanus tau.

324. Ventral view of larger distome. [See A, p. 469.] × 46. *g*, Genital aperture; *o*, ovary; *sr*, seminal vesicle; *t*, testes; *vg*, vitelline glands; *or*, ovum; *a*, margin, showing spines.
325. Ventral view of smaller distome. Letters as in fig. 324. × 46.
326. Spines on ventral side of neck of same. × 400.
327. Ventral view of another. *pr*, Vitelline reservoir. Other letters as in fig. 324. [See B, (*a*), p. 469.] × 46.
328. Ventral view of another. Letters as in fig. 324. [See B, (*b*), p. 469.] × 46.
329. Posterior margin of latter. × 400.
330. *Distomum* sp. from *Euchelyopus cimbrius;* ventral view. Letters as in fig. 324. × 46.



331. *Distomum simplex* Rudolphi, from *Microgadus tomcod;* young specimen compressed and killed by application of heat. Ovar; very indistinctly lobed. *cp*, Cirrus pouch; *ex*, excretory v— el; *g*, genital aperture; *o*, ovary; *t*, testes; *vg*, vitelline glands; *yr*, yolk reservoir. × 65.

. An adult with ova. Letters as in fig. 331. × 46.

. *Distomum rubellum* Linton, from *Stenotomus chrysops;* specimen made turgid by placing in fresh water. × 46.

334. Another from same host, but collected on different date, anterior end. × 46.

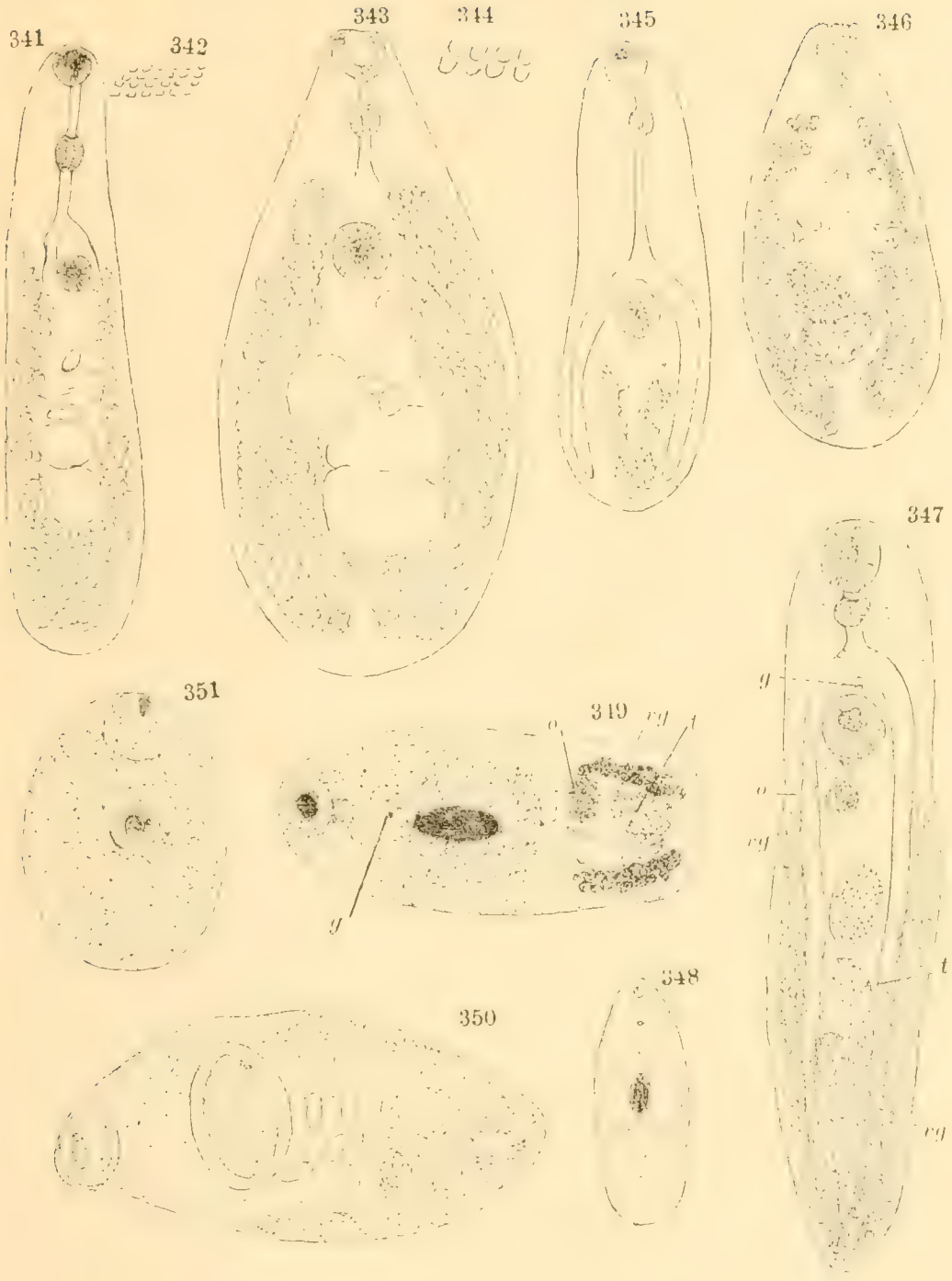
335. A specimen from *Merluccius bilinearis.* × 50.

336. A small specimen, finely corrugated with transverse wrinkles, from *Paralichthys dentatus.* × 100.

337. A specimen from *Pomatomus ——ix;* sketched from living worm slightly compressed. × 65. *f*, Posterior flaps, which were used by the worm as independent organs, which appeared to have a kind of clasping function.

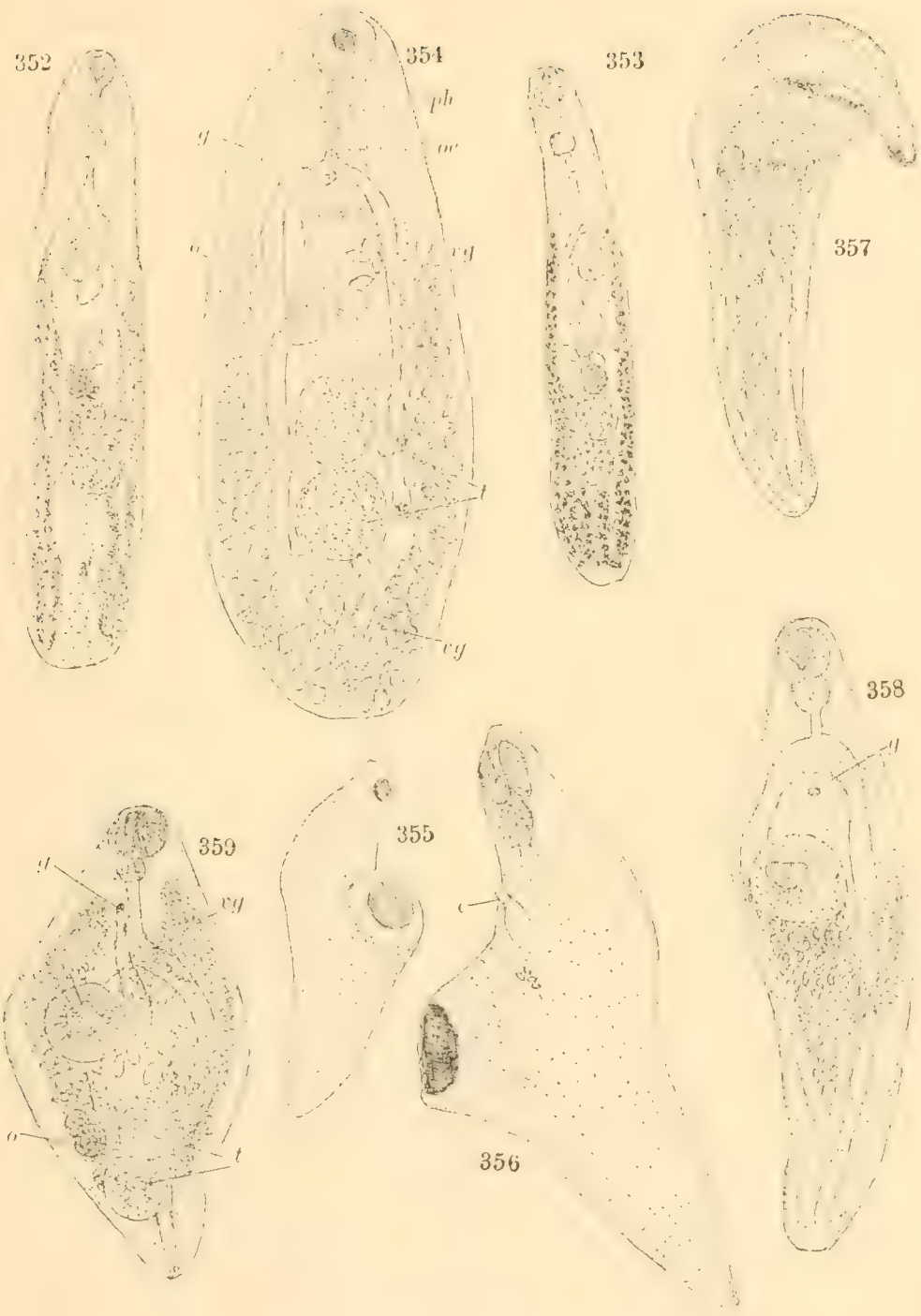
338, 339. Two other smaller individuals from same lot, made turgid with fresh water. × 65.

340. Specimen from *Pseudopleuronectes americanus*
a and *b*, Sketches of same worm in different stages of contraction. × 20.



341. *Distomum* sp. from *Pomatomus saltatrix*, slender variety. × 100.
342. Spines on neck of same. × 100.
343. Oval variety. × 100.
344. Spines on neck of same. × 100.
345. Probably same species, young, from *Paralichthys dentatus*. × 100.
346. Species near *Distomum pyriforme* Linton, from *Stenotomus chrysops*. × 100.
[See figs. 352–354 and descriptions in text.]

347. *Distomum globiporum* Rudolphi (?), from *Pseudopleuronectes americanus*. × 30. *g*, Genital aperture; *o*, ovary; *t*, testes; *eg*, vitelline glands.
348. *Distomum* sp. from *Raja laevis*. × 8.
349. Same, in glycerine. Letters as in fig. 347. × 14.
350. *Distomum* sp. from *Gasterosteus bispinosus*. × 100
351. Young distome from *Achirus fasciatus*. × 220.



352. *Distomum* sp. from *Paralichthys dentatus*, from life. ×100. [See fig. 345.]

353. *Distomum* sp. from *Rhombus triacanthus*, in glycerine. ×90. [See figs. 341–346 and text.]

354. *Distomum* sp. from *Fundulus heteroclitus*. Minute spines on body. ×50. *g*, Genital aperture; *o*, ovary; *oe*, œsophagus; *ph*, pharynx; *t*, testes; *vg*, vitelline glands.

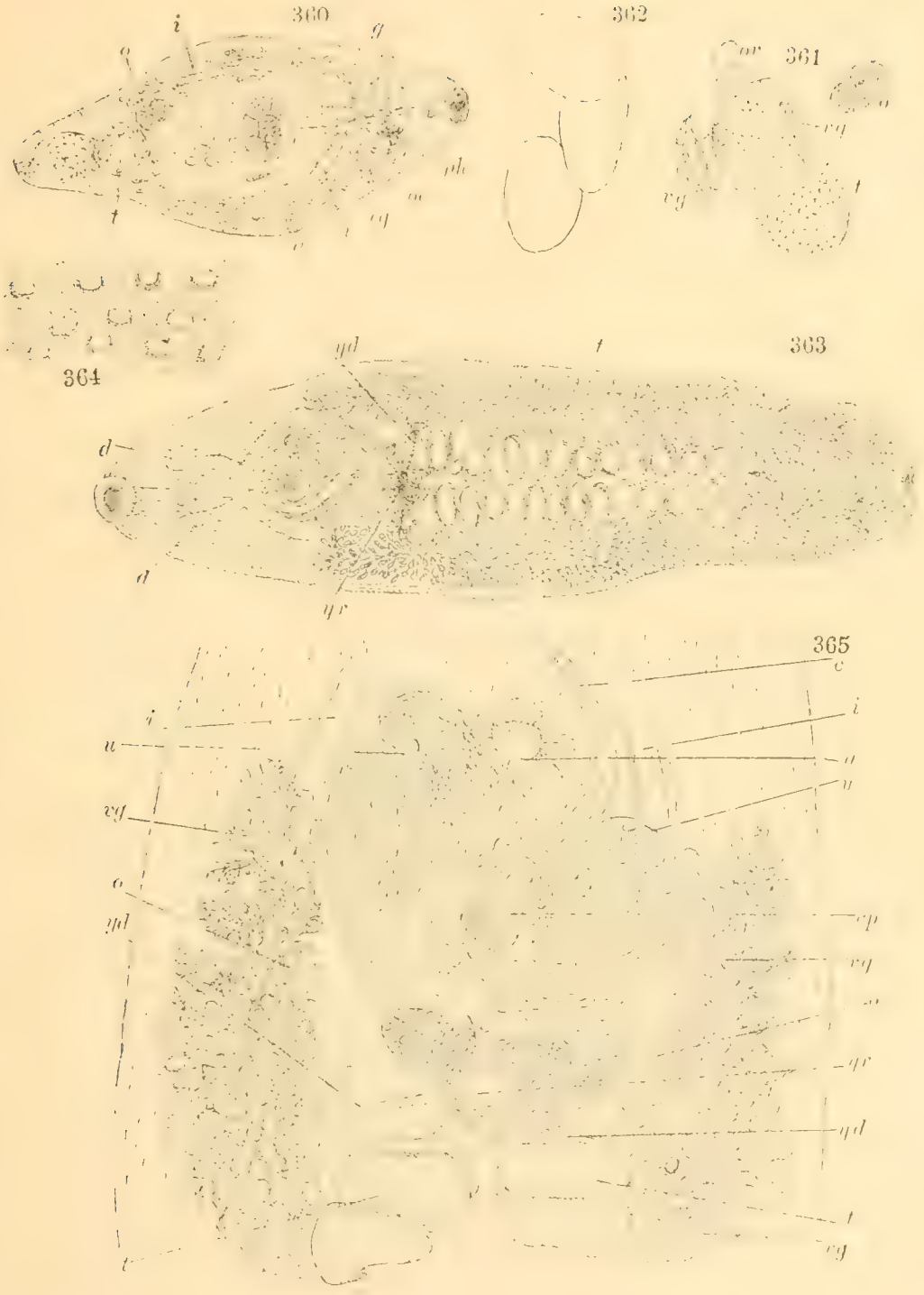
355. *Distomum lotharyngophoron* Olsson, from *Pomolobus pseudoharengus*. ×80.

356. From same host, but different date. *c*, Cirrus. ×100.

357. *Distomum* sp. from *Menidia notata*. *g*, Genital aperture. ×100.

358. Another specimen from same host, ventral view. ×160.

359. *Distomum* sp. from *Limanda ferruginea*, ventral view. Letters as in fig. 354.



360. *Distomum* sp. from *Limanda ferruginea*, continued. Restored from sections, partly diagrammatic. *a*, Vitelline reservoir; *gp*, genital aperture; *i*, intestine; *o*, ovary; *oe*, œsophagus; *ph*, pharynx; *t*, testes; *vg*, vitelline glands. × 46.

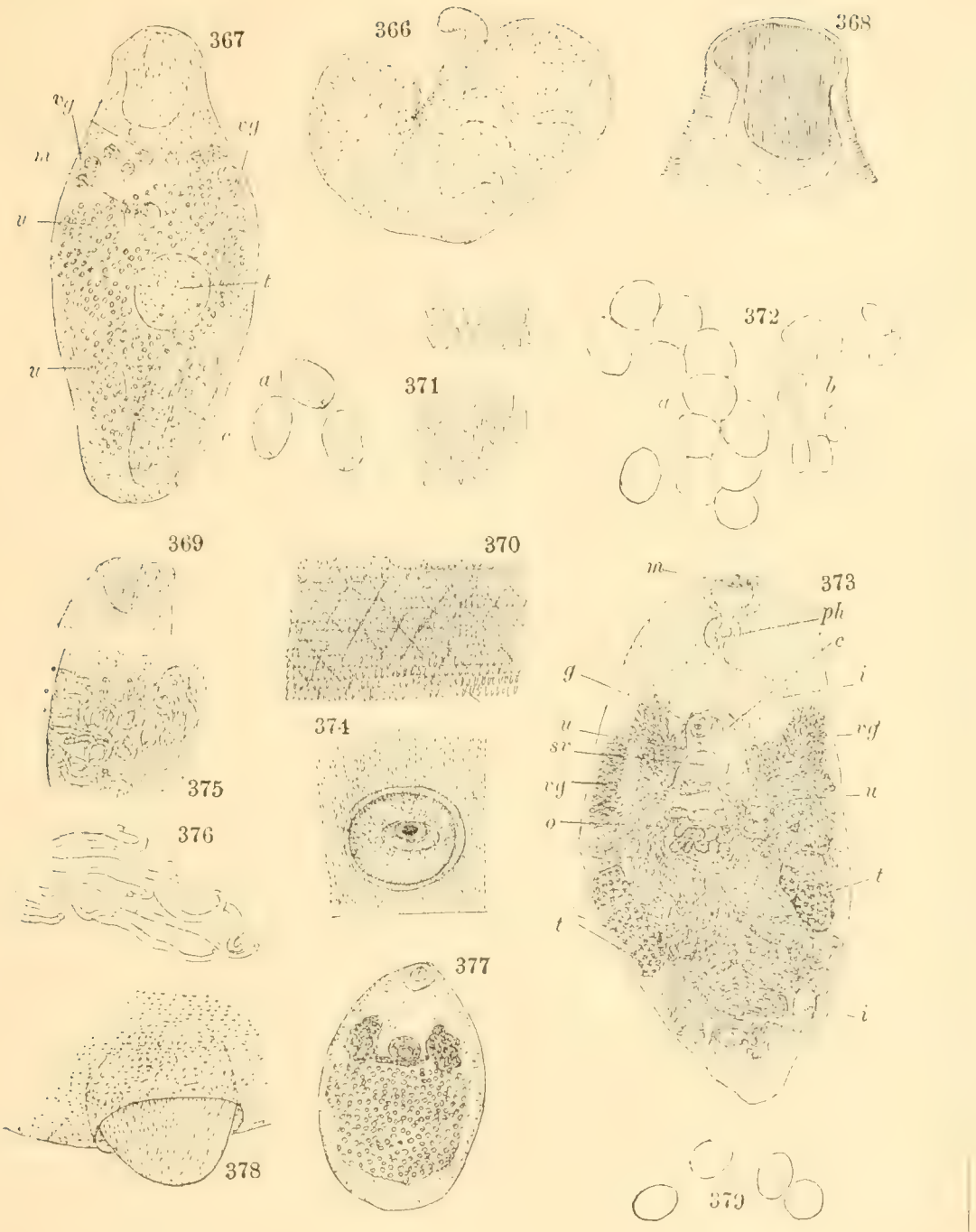
361. Testes, ovary, ova, and portion of vitellaria. Letters as in fig. 360. × 80.

362. Ova. × 300.

363. *Distomum polyorchis* Stossich, from *Cynoscion regalis*; ventral [illegible]. *d*, Digestive cæca; *i*, intestine; *t*, testes; *vd*, vitelline duct; *vr*, vitelline reservoir, lying on ventral side of ovary.

364. Spines on neck. × 400.

365. Details of post-acetabular region, ventral view. × 100. *c*, Cirrus; *u*, uterus. Other letters as in figs. 360, 363.



366. *Distomum* (*Köllikeria*) sp., from cyst in intestinal wall of *Scomberomorus maculatus*. Side view, life. × 100.
367. *Gasterostomum* sp., from *Tylosurus marinus*. 100. *c*, Cirrus; *m*, mouth; *t*, testes; *u*, uterus; *vg*, vitelline glands; *a*, ova. × 400.
368. Anterior end of specimen collected on different date. × 100.
369. *Gasterostomum* sp., from *Scomberomorus maculatus;* anterior end of specimen in glycerine. × 65.
370. Spines on neck, highly magnified.
371. Same. × 1,200.
372. Ova, two sizes, in uterus of same worm; *a*, large; *b*, small; life. × 400.
373. *Monostomum vinal-edwardsii* sp. nov., from *Opsanus tau;* ventral view; life. *c*, Cirrus; *g*, genital acetabulum; *i*, intestine; *m*, mouth; *o*, ovary; *ph*, pharynx; *sr*, seminal vesicle; *t*, testes; *u*, uterus; *vg*, vitelline glands. × 45.
374. Genital acetabulum; life. × 220.
375. Excretory vessels in neck, dorsal view; highly magnified.
376. Same, more highly magnified.
377. *Monostomum* sp., from *Pomolobus pseudoharengus;* ventral view; life. × 100.
378. Genital acetabulum; life. × 450.
379. Ova; life. × 400.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